

Edwin B. Forsythe
National Wildlife Refuge –
Headquarters
Impoundment
Design/Build Project

Environmental Assessment

U. S. Fish and Wildlife Service

2/4/2016

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LIST OF ACRONYMS

°C	Degrees Celsius
Amec	Amec Foster Wheeler, Environment & Infrastructure, Inc.
APE	Area of Potential Effects
BGEPA	Bald and Golden Eagle Protection Act
CACD	Cape Atlantic Conservation District
CAFRA	Coastal Area Facility Review Act
CFR	Code of Federal Regulations
CO	Carbon monoxide
County	Atlantic County
DFW	Division of Fish and Wildlife
DLUR	Division of Land Use Regulation
EA	Environmental Assessment
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FONSI	Findings of No Significant Impact
HQ	Headquarters
IPaC	Information, Planning, and Conservation
MBTA	Migratory Bird Treaty Act
mg/L	Milligrams per liter
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA Sec. 106	National Historic Preservation Act of 1966
NJAAQS	New Jersey Ambient Air Quality Standards
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJFO	New Jersey Field Office
NJSA	New Jersey Statutes Annotated
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOx	Nitrogen oxides
NTU	Nephelometric Turbidity Unit
NWI	National Wetlands Inventory
OLE	Office of Law Enforcement
Refuge	Edwin B. Forsythe National Wildlife Refuge
Service	U.S. Fish and Wildlife Service
SHPO	State Historic Preservation Office
SILs	Significant Impact Levels
SOx	Sulfur oxides
System	Headquarters Impoundment System

LIST OF ACRONYMS (Continued)

USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
WCS	Water Control Structure
WMA	Watershed Management Area

Chapter 1 Purpose and Need

1.1 Introduction and Background

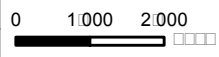
The National Environmental Policy Act [42 United States Code (U.S.C.) 4321 *et seq.*; NEPA] and the Council on Environmental Quality's NEPA regulations [40 Code of Federal Regulations (CFR), Parts 1500 to 1508] require that the potential environmental impacts of a Proposed Action be considered before a final decision to carry through with the Proposed Action is made. In compliance with these regulations, this Environmental Assessment (EA) examines the need for the Proposed Action, the potential environmental impacts of the Proposed Action and the No Action Alternative, and identifies the unavoidable adverse environmental impacts identified as a result of the Proposed Action, if it were to be implemented.

The Proposed Action is the restoration of an area designated as the Headquarters (HQ) within the U.S. Fish and Wildlife Service (the Service) Edwin B. Forsythe National Wildlife Refuge (the refuge) (Project). The Project is located in the unincorporated community of Oceanville, Galloway Township, Atlantic County, New Jersey (**Figure 1.1**) and is identified by Galloway Township as a portion of Block 1301, Lot 1. The parcel is located in the Coastal Plain physiographic section of the State, within both the Mullica and Great Egg Harbor Watershed Management Areas (WMA 14 and WMA 15, respectively) (**Figure 1.2**).

The Project area consists of a number of impoundments known as the HQ Impoundment System (the System). The System was constructed in the early 1950s to allow the Service to manage the habitat needs of migratory birds. The System includes the East Pool, West Pools, Experimental Pool, Gull Pond, Doughty Creek, and Lily Lake. Various dikes and water control structures (WCSs) are used to actively manage the inflow and outflow of water in the System, though currently one of the dikes has been breached and some of the WCS's are inoperative. An approximately 8-mile perimeter dike surrounds the East and West Pools which is used as a wildlife viewing drive (Wildlife Drive) and receives over 100,000 visitors annually. Dikes separate the East and West Pools (Cross Dike), and bisect the West Pool in an east-west direction (Long Dike), as well as separate the West Pool into a northern (~ 500 acres) and southern section (~300 acres) (**Figure 1.3**).

The West Pool, including the northern portion, also known as Vogt Pool North, and the southern portion, also known as Vogt Pool South, are maintained as freshwater impoundments. These pools will hereafter be referred to in this EA as the Northwest and Southwest Pools. Freshwater inputs to the Northwest and Southwest Pools include Doughty Creek, Lily Lake, and freshwater springs (USFWS 2013) (**Figure 1.4**). Water flow into the Northwest and Southwest Pools is managed through WCS #12 (Northwest Pool) and through WCS #11 (Southwest Pool). Outflow is provided through WCS #9 (Northwest Pool) and #10 (Southwest Pool).

The Project includes the repair of Long Dike, the replacement of inoperative WCS #3, the placement of new erosion control material at Turtle Cove and Dogleg to address concerns with resiliency of the dike system to sea level rise brought about by climate change, and the repaving of Wildlife Drive. Additionally, this EA considers the possibility of

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replacing the inoperative WCS #7. Resiliency concerns are further addressed through adaptive water management practices recommended as part of the overall Project.

Prior to being breached, Long Dike provided for independent management of water levels in Northwest and Southwest Pools. This gave the refuge the ability to treat exotics, encourage growth of high value food sources, and provide suitable habitat for migratory birds with greater precision.

The East Pool (~536 acres), also known as the Danzenbaker Pool, is maintained as a saltwater impoundment through WCS's #1, #3, #4, and #5. When created, East Pool was intended to serve as a freshwater impoundment like the West Pools. However, the pool never functioned efficiently and became dominated by the invasive common reed (*Phragmites australis*). In 2007, the decision was made to transition East Pool into a tidal salt marsh system. Water currently flows into the pool through WCS's #1, #3, #4, and #5, on rising tides and out through WCS #3 on falling tides. Due to the constriction of tidal flow through the WCS's, the East Pool tidal regime is offset from the surrounding waters. The offset provides a mosaic of saltmarsh habitat at different tide stages which increases foraging opportunities for wildlife.

Hurricane Sandy significantly impacted the dike system and required emergency repairs to maintain its integrity. A combination of Sandy's storm surge, a full moon high tide, and rain produced water levels four feet over normal high tides. Coastal floodwaters inundated Wildlife Drive and filled the impoundment pools with saltwater. During most storms, the salt marshes absorb wave energy providing a buffer to Wildlife Drive. During Sandy, these salt marshes were completely submerged, leaving Wildlife Drive vulnerable. After the eye passed over the refuge, the tide began dropping and southerly winds quickly rose to hurricane force. Wind-driven waves built across 5 miles of Reeds Bay before crashing onto Wildlife Drive, eroding away the dike. All of the dikes were impacted, with the south dike, particularly at Turtle Cove, incurring the most severe damage.

Following the impacts of Hurricane Sandy, the refuge received over \$1 million from the Federal Highways Administration to conduct emergency repairs to the HQ Impoundment System, particularly South Dike. While that project was a success, it did not restore the dikes to pre-Sandy condition. Subsequently, the refuge received \$30 million through the Hurricane Sandy Disaster Relief Supplemental Appropriations Act of 2013 to remove debris, repair infrastructure, and increase the resiliency of candidate degraded salt marsh units. A portion of that funding is being used to make improvements to the System.

A combination of reduced functionality over time and impacts from storm events have limited the refuge's ability to manage the System. As previously mentioned, many of the WCSs and dikes are either not functioning as intended or are expected to be compromised further. For example, WCS #3, located at the northeastern corner of the East Pool, is the primary outlet for water exchange between the pool and the surrounding tidal waters. Although presently operational, this structure is not water-tight and thus allows hydraulic exchange that is far greater than desired by the Service. Also, a significant length of the Long Dike, which separates the West Pool into a north and south portion, has been breached, resulting in the West Pools becoming a single large pool. Other areas of concern include eroded areas of Wildlife Drive; most notably, the outboard slopes near Turtle Cove in the southern portion of the drive and the outboard slopes near the Dogleg section in the

northern portion of the drive. These areas are considered susceptible to overtopping in the future from tidal surge events with 10-year waves if not repaired (SDE 2015). **Appendix A** presents photographs of the various Project areas.

1.2 Purpose and Need for the Proposed Action

The refuge is managed as part of the National Wildlife Refuge System, whose mission is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” (National Wildlife Refuge System Improvement Act of 1997, Public Law 105-57). The refuge was established for the following purposes (USFWS 2013):

- For lands acquired under the Migratory Bird Conservation Act (16 U.S.C. §715-715r), as amended, “...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds...” (16 U.S.C. §715d)
- For “...the development, advancement, management, conservation, and protection of fish and wildlife resources...” (16 U.S.C. §742f(a)(4), Fish and Wildlife Act of 1956)
- For “...the conservation of wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations (regarding migratory birds)...” (16 U.S.C. §3901(b), 100 Stat. 3583 Emergency Wetlands Resources Act of 1986)
- To “...secure for the American people of present and future generations the benefits of an enduring resource of wilderness.” (78 Stat. 890:16 U.S.C. 1211 (note), 1131-1136, Wilderness Act of 1964).

The entire System was originally designed to maintain freshwater or brackish wetlands and associated flora and fauna. The East Pool was designed to receive freshwater from the western pools through WCS’s #6 & #8 and tidal flow in from the adjacent estuary through four open tide gates (WCS #1, #3, #4 and #5). However, the discharge pipe for WCS #8 was damaged in Hurricane Sandy and is currently buried and non-functional. WCS #6 is also currently non-functional (silted-in). Therefore, the influx of freshwater to East Pool from the western pools has been cut off. In addition, a 2015 water balance study conducted within the System indicated that there is not enough freshwater supplied to the System, via Doughty Creek and Lily Lake, to be able to support the East Pool as a freshwater impoundment system as originally intended (Amec 2015). Subsequently, the Service has decided not to attempt to convert East Pool back into a freshwater community, but will continue to manage it as a salt marsh habitat for waterfowl, shorebirds and piscivorous migratory birds (USFWS 2004).

Water drawdowns and flooding are management strategies used by the Service to mimic the dynamic water regime of some natural wetlands. This water level management is typically timed to benefit shorebirds, wading birds, and/or waterfowl (USFWS 2013). However, the System in its current condition cannot be used to effectively maintain separate freshwater and saltwater wetland habitats within a tidal estuary. The breaches in Long Dike prevent independent management of the West Pools, reducing the Service’s ability to control exotic plant species, and encourage growth of high value food sources. The Turtle Cove and Dogleg sections of the System suffered erosion during Hurricane Sandy and, although they underwent emergency repairs, are still susceptible to

erosion which would jeopardize the integrity of the System if they were breached in future storms. The degradation of WCS#3 may lead to instability within the Wildlife Drive, which would reduce wildlife viewing opportunities provided to over 100,000 people that visit the refuge annually. Loss of such high value habitats can have detrimental impacts on migrating bird populations that rely on the site for foraging, reproduction, and survival. Therefore, the refuge's established habitat management objectives cannot be met at this site in its current condition. The Proposed Action will increase resiliency of the dikes and restore water flow, control, and containment function within the System, thereby re-establishing fully-functional wetland habitats within the pools. Restoring management ability will allow the Service to manage the System appropriately as freshwater and salt marsh habitat for waterfowl, shorebirds and piscivorous (fish-eating) migratory birds for both existing conditions, as well as potential conditions resulting from climate change.

1.3 Scope of Analysis

This EA describes the existing environmental resources of the Project area, describes the Proposed Action, and assesses the potential impacts to those resources from implementation of the Proposed Action. Alternatives to the Proposed Action are presented and the potential impacts to the existing environmental resources are also assessed. Alternatives considered, but not studied further due to disqualifying factors (cost prohibitive, limited benefits, etc.) are described in Section 2.5. This assessment was performed using existing information about the Project area, supplemented with literature review, site surveys, and data gathering efforts.

1.4 Public Participation and Coordination

NEPA requirements help ensure that environmental information is made available to the public during the decision-making process and prior to implementing an action. The premise of NEPA is that the quality of decisions will be enhanced if proponents provide information to the public and involve the public in the planning process. The Service has conducted public outreach for this Project through website updates and press releases. The Service has been, and will continue to be, in coordination with other Federal and New Jersey State agencies throughout this Project. State and Federal permit reviews will also include public comment periods and meetings. Federal and State laws relevant to this Project are as follows:

- Federal level:
 - The Federal Water Pollution Control Act (Clean Water Act; 33 U.S.C. 1251 *et seq.*).
 - The Rivers and Harbors Act of 1899 (33 U.S.C. 407).
 - The Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531-1544).
- State level:
 - Waterfront Development Act (New Jersey Statutes Annotated [N.J.S.A.] 12:5-3).
 - Wetlands Act of 1970 (N.J.S.A. 13:9A).
 - Tidelands Act (N.J.S.A. 12:3).
 - Safe Dam Act (N.J.S.A. 58:4-1).
 - Coastal Area Facility Review Act (CAFRA; N.J.S.A. 13:19).

A number of agencies have been and will be involved in the review and permitting of the Project. These agencies are as follows:

- State level:
 - New Jersey Department of Environmental Protection (NJDEP), Division of Land Use Regulation (DLUR).
 - NJDEP, Bureau of Coastal Management.
 - NJDEP, Bureau of Dam Safety and Flood Control.
 - NJDEP, State Historic Preservation Office (SHPO).
 - NJDEP, Division of Fish and Wildlife (DFW).
- County level:
 - Cape Atlantic Conservation District (CACD).

Coordination and consultation with State agencies have been conducted throughout the planning stages of this Project. **Table 1.1** below presents a summary of the permits sought to complete this Project.

Table 1.1 Required Permits and Authorizations		
Permit or Authorization	Agency	Status
Dam Safety Permit	NJDEP	Application in progress
Waterfront Development Permit (In water)	NJDEP	Application in progress
Coastal Wetlands General Permit #24	NJDEP	Application in progress
CAFRA Individual Permit	NJDEP	Application in progress
Tidelands Instrument	NJDEP	Application in progress
Nationwide Permit #3	United States Army Corps of Engineers (USACE)	Application in progress
Nationwide Permit #13	USACE	Application in progress
Erosion and Sedimentation Control Plan	CACD	Application in progress
NHPA Sec. 106 Compliance	USFWS	Application in progress

Chapter 2 Alternatives Including the Proposed Action

Two alternatives, one with optional supplemental activity, were considered during the development of this EA. Alternative 1 is the Proposed Action, and includes repairing and regrading/stabilizing eroded portions of the dikes within the System, replacing WCS #3, and resurfacing Wildlife Drive. Alternative 1 is considered to be the preferred alternative as it is the most direct and effective approach for achieving the Project objectives of adequately managing the System to achieve the Service's wildlife management goals, as well as being able to respond to climate change. Subsets of this alternative, Alternatives 1a and 1b, include supplemental actions that are contingent upon funding. The Alternatives Considered but Eliminated section details potential actions that were considered as part of data gathering efforts, but were removed from consideration due to disqualifying factors such as cost-effectiveness and producing adverse impacts with limited benefit. These and the No Action Alternative are described below.

The implementation of Alternatives 1a and 1b would serve to further the Project objective of the Service, which is to implement a new water management plan that more effectively controls the eastern and western pools as separate saltwater and freshwater wetlands, respectively. Water flow and containment function will also be increased to more effectively establish three separate, fully-functional wetland habitat communities within the three larger impoundments under these alternative supplements.

2.1 Alternative 1 – Proposed Action

Freshwater coastal impoundments require significant maintenance to remain functional. However, when properly managed and maintained, coastal impoundments have a high carrying capacity for waterbirds and contribute to increased biodiversity. Accelerated sea level rise and large storm events, such as hurricanes and nor'easters, are expected to increase the risk of breaching of dike structures used to maintain coastal impoundments, thereby necessitating re-evaluation and adaptation of management techniques (USFWS 2004).

A number of individual restoration/construction/management activities are planned as part of the Proposed Action. The first action includes the repairing and filling of the Long Dike breach (the dike separating the two western impoundments), allowing for the more effective management of the western impoundments. The breach of Long Dike has eliminated the ability of the Service to manage the western impoundments as two distinct wetland systems. The breach is actually two separate eroded areas that, when combined, extend 580 feet along the east/central alignment of the dike. Approximately 3,220 additional feet of the dike is eroded and in disrepair, requiring regrading and filling. The repairs to the dike will allow the Service to once again manage the western impoundments as two separate pools.

A second action includes the replacement/addition of riprap armoring at two distinct locations along the North and South Dikes to stabilize downstream embankment slopes. The current conditions are such that riprap that was historically placed within the Turtle Cove section of South Dike is no longer effective and the Dogleg portion of North Dike is vulnerable as its slopes have never been stabilized using riprap or other engineering controls. Therefore, these areas are subject

to increased erosional pressures that would result from severe storms, sea level rise, or other climatic actions that would occur as a result of climate change.

An assessment of the eroded sections of Turtle Cove and the Dogleg revealed that these two areas are feasible for a living shoreline in contrast to solely hard engineering. Where feasible, living shorelines are an effective alternative to traditional shoreline hardening. This technique provides shoreline protection with benefits to wildlife and water quality through the use of vegetation and a medium for sediment/soil microbial activity. With long-term protection of these shorelines as a goal, the following summarizes the general steps in establishing the living shoreline:

- Excavate an anchor trench at the toe of slope.
- Regrade the shoreline to a 5H:1V slope.
- Place a geotextile underlayment.
- Place 18 inches of R5 stone (9 to 18 inch sized) on geotextile.
- Place sandy soil to fill voids to provide planting medium.
- Revegetate with a combination of seed mix, herbaceous plugs, and potted plants.

A third activity includes the replacement of WCS #3. WCS #3 is not functioning appropriately, which precludes the control of water into or out of the eastern impoundment. This failure compromises the ability of the Service to manage the pool in accordance with the management objectives of the refuge. The scour and erosion around this WCS is so significant, it contributed to the increased Priority Ranking Factor value and overall safety classification of “Conditionally Poor” for the Wildlife Drive dike inspection report (SDE 2015).

Because previous attempts to repair erosion and scour at WCS#3 by adding fill and riprap was met with limited or no success, replacement of the structure is required. A new WCS #3 is also necessary to reduce velocities into and out of the East Pool as recommended by SDE 2015. The design of the replacement WCS will be in line with the Service’s decision to maintain the East Pool as a salt marsh community.

A final activity within the Proposed Action includes the re-surfacing of the Wildlife Drive road way. This will be accomplished with the application of 2-1/2 inches of crushed concrete roadway aggregate.

A more detailed list of components required for each task is presented in **Appendix B**. The Statement of Work is presented in **Appendix C**. A summary of the restoration components to be performed is listed below:

- Repair the breached and eroded portions of the Long Dike.
- Armor/stabilize the Dogleg section of the North Dike.
- Armor/stabilize the Turtle Cove Section of the South Dike.
- Replace the East Dike WCS #3.
- Re-surface (cap) approximately 6 miles of Wildlife Drive.

The completion of this Project would satisfy the objective of the Service, which is to implement a new water management plan for the wetland System to maintain the eastern and western pools as separate saltwater and freshwater wetlands, respectively. There will be no change in size, nor conversion of existing water bodies/wetlands to that of a different salinity regime under the proposed alternative (**Table 2.1**). Freshwater systems will remain fresh, and saltwater will remain saline. Under the preferred alternative, water flow and containment function will be adjusted to effectively establish three separate, fully-functional wetland habitat communities within the three larger impoundments. This will help give the Service the ability to better manage the impoundments as wintering grounds and migratory stopover sites or as breeding grounds for bird species reliant on such habitats (Amec 2015).

Table 2.1			
Project Area Waterbodies Pre- and Post-Construction			
Waterbody	Acreage	Pre-Construction Habitat Type	Post-Construction Habitat Type
Lily Lake	22	Freshwater	Freshwater
Doughty Creek	54	Freshwater	Freshwater
Experimental Pool	21	Freshwater	Freshwater
Northwest Pool	526	Freshwater	Freshwater
Southwest Pool	296	Freshwater	Freshwater
East Pool	536	Saltwater	Saltwater

The resurfacing of Wildlife Drive will “cap” the dike, creating a more wear-resistant surface to increase resiliency of the exterior roadway. Access to the refuge areas for the Service as well as for the hundreds of thousands of visitors that come to the refuge each year will also be improved.

Various supplemental activities have been identified by Amec that would potentially allow for greater management of the water within the System, and would allow for a higher degree of adaptive management by the Service in reaching their wildlife management objectives. These supplemental activities would potentially be incorporated into the Proposed Action should funding be made available by the Service. The individual potential alternatives are described as follows:

2.2 Alternative 1a – Proposed Action and Replacement of WCS #7

Alternative 1a includes the Proposed Action and replacement of WCS #7 along the Long Dike. Water Control Structure #7 is not functioning properly, and coupled with the current breach in the Long Dike, collectively adds to the lack of water control between the two western impoundments. Replacement of WCS #7 within the footprint of the Long Dike Breach Repair would allow the Service the flexibility to manage water levels between the Northwest and Southwest Pools, and would greatly aid in the ability of the Service to address habitat management concerns within the pools. Placing the replacement WCS #7a within the footprint of construction greatly simplifies the process of installing this structure.

2.3 Alternative 1b – Proposed Action and Stop Log Installation

Alternative 1b includes the Proposed Action and the replacement of the existing 6-8 inch stop logs with low height (less than 4 inches) stop logs at each of the WCSs in the System. This feature would allow for fine-tune management and control of hydraulic exchange than what is offered by the WCSs alone.

2.4 Alternative 2 – No Action

Another alternative explored for this Project was the No Action Alternative, which would allow for no repairs to the eroded dikes, leaving damaged WCS #3 in place, and no resurfacing of Wildlife Drive. This No Action Alternative is not preferred because surrounding wave action and future rises in sea level could reduce the ability of the dikes to withstand increased pressures of wind and waves. In addition, the civil/hydraulic configuration of WCS #3 on East Dike is of concern as scour was confirmed on both the inlet and outlet side of the WCS (SDE 2015). If not fixed, the flow of water between the East Pool and the surrounding estuary will remain uncontrollable and could lead to increased instability within the System and may jeopardize the roadway.

Without repairing the dikes and replacing WCS #3, the ability to control water flow into and out of the three impoundments will not be reestablished and critical wetland habitat used by thousands of migrating birds annually will be lost. Controlled drawdowns, used to provide foraging habitat for shorebirds by creating mudflats and shallow water areas, while at the same time concentrating food for wading birds, will not be possible. The storage of water in an impoundment over the growing season, or several growing seasons, to provide breeding habitat for waterfowl and marsh birds, will also not be possible. This will be detrimental to avian species that use the HQ impoundments, as the preference of bird species to utilize certain habitat types is not always consistent and predictable. Therefore, management of water levels for a particular species is an ongoing process requiring ongoing adaptive management strategies.

If the structures are not repaired/replaced, the ability to control invasive species and promote desirable plants will also be lost. Plants such as the invasive non-native common reed requires diffusion of gasses through rhizomes which cannot occur when the plant becomes over inundated with water. Flooding an impoundment through all or part of a growing season, stymies growth of such undesirable vegetation. Drawdown following flooding allows for germination of moist-soil plants preferred by waterfowl (USFWS 2013).

Further erosion of the dikes and the area around WCS #3 can also lead to an increase in turbidity in the area, causing damage to surrounding benthic and fish communities.

2.5 Alternatives Considered but Eliminated

2.5.1 Dredging and Grading of the Impoundments

Dredging and grading of the impoundment bottom would manipulate the bathymetry such that the refuge would have greater control over water levels within the pools as well as the amount and

type of habitat available to migratory birds. This alternative was eliminated from further consideration as it would be logistically difficult and cost prohibitive with no guarantee of long-term habitat benefit. Dredging of Lily Lake would provide no benefit in water storage as the elevation of Lily Lake's lakebed is too similar to the impoundments to allow the movement of additional water. Lowering the impoundment bottom within West Pool could also increase the risk of salt water seepage from surrounding waters and make the System less resilient to sea level rise.

2.5.2 Increase Stream Flow to Enhance Water Supply

A water balance study done in 2015 determined the System's water availability is limited by rainfall and the storage capacity of Lily Lake (Amec 2015). To increase water availability, a well could be established to feed freshwater into the System. This alternative was eliminated from further consideration as it would require comprehensive modeling and could potentially affect groundwater availability for the watershed, possibly increasing the rate of salt water inundation to the aquifer.

2.5.3 Subdivide the West Pools

Building additional dikes within the West Pools, effectively creating a series of smaller pools, would allow greater flexibility of management of the Pools. This alternative was eliminated from further consideration as it would be cost prohibitive, require several new WCSs, and impact much more freshwater habitat compared to the preferred alternative.

Chapter 3 Affected Environments and their Existing Conditions

3.1 Introduction

This section describes the existing environmental resources in the Project area, grouped according to physical resources (topography, geology, etc.), biological resources (vegetation, wildlife, etc.), and other categories such as cultural resources, socio-economic and environmental justice, and transportation.

3.2 Physical Environment

3.2.1 Topography

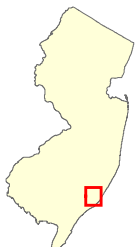
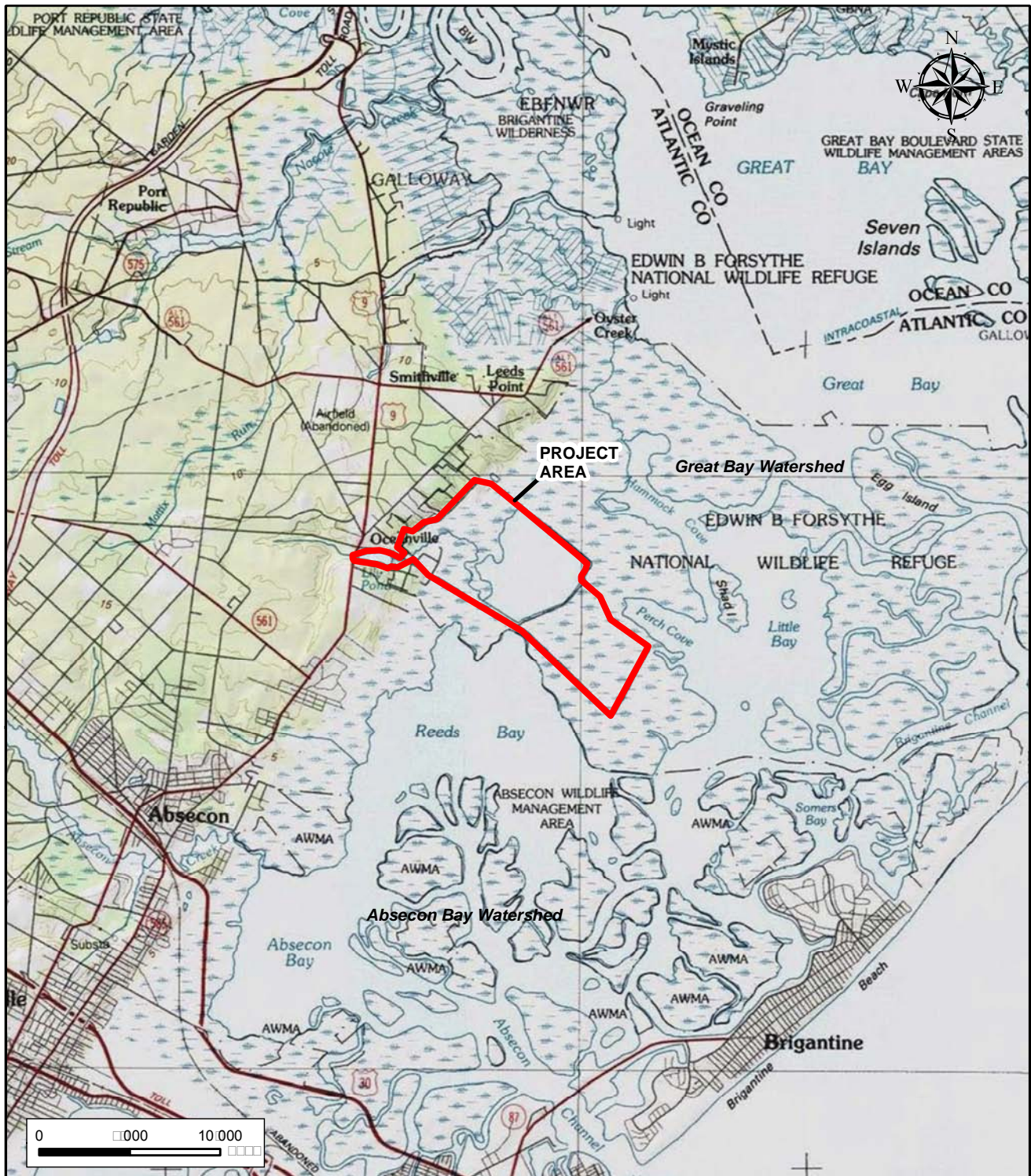
The topography of the Project area is relatively flat, with the exception of the man-made dikes that were used to construct the System. The Project area is situated between 0 and 5 feet above mean sea level (**Figure 3.1**). Net local surface water from the dikes drain into the wetlands contained within the pools and into the adjacent estuaries.

3.2.2 Geology and Soils

The site is located within the outer Coastal Plain Physiographic section of New Jersey (USFWS 2013). The unconsolidated deposits of this province range in age from the Cretaceous to the Miocene (135 to 5.3 million years old) and gently dip to the southeast, towards the coast and extend beneath the Atlantic Ocean to the edge of the Continental Shelf (Dalton 2003; NJDEP 1999). The topography across the Coastal Plan is relatively flat to very gently undulating. The sediments consist of alternately-deposited layers of sand, silt, and clay which outcrop in irregular bands that trend northeast to southwest within deltaic and marine environments occurring at sea level (NJDEP 1999).

The bedrock geology on the eastern one-third of the site is made up of the Belleplain Member, which consists of clay at the base and fine- to medium-grained quartz sand on top. The western two-thirds of the site is made up of the Cohansey Formation, which consists of medium- to coarse-grained quartz sand. The surficial geology over the Project area is listed as Salt-Marsh and Estuarine Deposits. These soils, deposited during the Holocene Era, occur in salt marshes, estuaries, and tidal channels in thicknesses of up to 300ft. They are described as dark in color, ranging from brown, dark brown, gray, to black, and are composed of silt, sand, peat, and clay with minor pebble gravel (NJDEP 2014).

The site is mapped to occur primarily on Transquaking mucky peat, 0-1% slopes, very flooded surficial soils (**Figure 3.2**). The Transquaking series is described by the United States Department of Agriculture (USDA) as very deep, very poorly drained soils, containing organic deposits underlain by loamy mineral sediments and flooded by tidal water. These Euic, mesic Typic Sulfihemists soils are found in brackish, estuarine marshes along tidally-influenced rivers and creeks. The Transquaking Series soils were previously mapped as Tidal Marsh miscellaneous area (USDA 2015).



Legend symbols for various map features.

Map data and scale information.

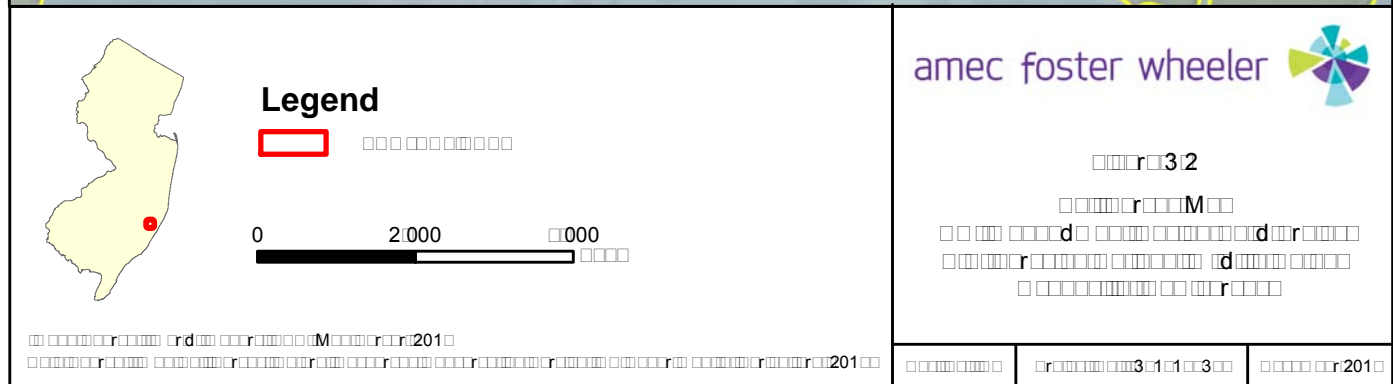
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Map scale and legend information.

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3.2.3 Water Quality

According to NJDEP (2008), “The Surface Water Quality Standards are developed and administered in conformance with requirements of the Federal Water Pollution Control Act 33 U.S.C. §1251 (also called the Clean Water Act) and the Federal regulatory program established by the United States Environmental Protection Agency (USEPA) at 40 C.F.R. Part 131. The Surface Water Quality Standards are also developed pursuant to the New Jersey Water Quality Planning Act, N.J.S.A. 58:11A et. seq. and the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A et. seq. Surface Water Quality Standards establish designated uses, classify streams based on uses, designate anti-degradation categories, and develop water quality criteria to protect those uses. In addition, the standards specify general, technical, and interstate policies, and policies pertaining to establishment of water quality-based effluent limitations.”

All waters within the refuge near Brigantine, New Jersey are classified as a FW2-NT/SE1(C1) according to New Jersey Surface Water Quality Standards (NJDEP 2011). This classification is for general freshwater not set aside for trout production or trout maintenance as well as for saline estuarine waters with shellfish harvesting as a designated use. According to the NJDEP (2011), “Category one waters” means those waters designated in the tables in New Jersey Administrative Code (N.J.A.C.) 7:9B-1.15(c) through (i), for purposes of implementing the antidegradation policies set forth at N.J.A.C. 7:9B- 1.5(d), for protection from measurable changes in water quality based on exceptional ecological significance, exceptional recreational significance, exceptional water supply significance or exceptional fisheries resource(s) to protect their aesthetic value (color, clarity, scenic setting) and ecological integrity (habitat, water quality and biological functions).”

Water quality parameters such as temperature, salinity, pH, dissolved oxygen, total suspended solids and turbidity have not been measured at the Project site.

3.2.4 Air Quality

The USEPA has set National Ambient Air Quality Standards (NAAQS) for six commonly found air pollutants as part of the Federal Clean Air Act requirements. These pollutants (also known as criteria pollutants) include particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide (CO), sulfur oxides (SO_x), nitrogen oxides (NO_x), and lead. These pollutants are known to harm human health and the environment and also cause property damage. The USEPA regulates pollutants by developing human health-based and/or environmentally-based criteria (science-based guidelines) for setting permissible levels (NJDEP 2015). New Jersey is located in the Northeast Ozone Transport Region, an area that covers the 11 northeastern states from Maryland to Maine as well as Washington, DC, and portions of Northern Virginia. Atlantic County, along with the rest of New Jersey, is designated as a marginal nonattainment area for the 8-hour ozone standard, but it is in attainment of all other standards. Investigations at the refuge include monitoring for ozone, sulfur dioxide, fine particulates, light attenuation, visibility and mercury. Results indicate that the low-altitude ozone levels are high at the refuge with resulting damage to vegetation (USFWS 2013).

The Wilderness Area of the refuge is classified as a Class I Air Quality Area, which affords it special protection under the Clean Air Act. The Service was charged, through a directive from

Congress, with the responsibility of protecting air quality and air quality-related values, including vegetation, wildlife, soils, water quality, visibility, odors, and the historic properties of the area from manmade pollution (USFWS 2013).

The USEPA and NJDEP regulations require proposed projects to demonstrate that predicted impacts will not cause or significantly contribute to a violation of the NAAQS or the New Jersey Ambient Air Quality Standards (NJAAQS). Toward that end, the USEPA and NJDEP have established Significant Impact Levels (SILs), which are a small fraction of the NAAQS/NJAAQS. Predicted impacts less than SILs are deemed insignificant, and therefore will not cause or contribute to an air quality standard violation.

3.2.5 Wetlands and Streams

The Clean Water Act defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." (40 CFR 230.3)

Using that definition, wetlands are defined based on certain characteristics of plants, soils, and hydrology. For vegetation, the majority of the plant species must be categorized as hydrophytic or adapted to living in saturated areas. Soils are considered hydric if they meet the criteria defined by the National Technical Committee for Hydric Soils. Hydrology is determined based on having a sufficient amount of water, whether saltwater, brackish, or fresh, that the soil is saturated during long periods of the vegetative growing season.

The most common means of characterizing wetlands is under the system developed by the Service. As described in *Classification of Wetlands and Deepwater Habitats of the United States* (FWS/OBS-79/31), wetland types can be broken down into five basic categories. These categories include marine, estuarine, riverine, lacustrine and palustrine wetlands. The major categories or systems are based mostly on the hydrologic base for the wetlands. Each of these systems can be further broken down into subsystems, classes, subclasses and dominance types based on the type of vegetation present and/or the bottom substrate for the wetlands.

Doughty Creek and Lily Lake are the main contributors of fresh water into the System. The Service's National Wetlands Inventory (NWI) indicates that Lily Lake's open-water communities are classified as follows (USFWS 2015):

- Lacustrine, limnetic, unconsolidated bottom, permanently flooded, diked/impounded (L1UBHh).
- Lacustrine, littoral, aquatic bed, permanently flooded, diked/impounded (L2ABHh).

The NWI indicates that Doughty Creek and its associated wetlands are classified as follows (**Figure 3.3**):

- Palustrine, forested, needle-leaved evergreen/broad leaved deciduous, saturated (PF04/1B).
- Palustrine, emergent, persistent, semipermanently flooded (PEM1F).
- Palustrine, forested, broad leaved deciduous, saturated (PF01B).
- Palustrine, scrub-shrub, broad leaved deciduous, saturated (PSS1B).
- Palustrine, scrub-shrub, broad leaved deciduous, seasonally flooded (PSS1C).
- Palustrine, forested, broad leaved deciduous/needle-leaved evergreen, saturated (PF01/4B).
- Palustrine, unconsolidated bottom, permanently flooded, excavated (PUBHx).
- Palustrine, unconsolidated bottom, permanently flooded (PUBH).
- Palustrine, unconsolidated bottom/aquatic bed, permanently flooded (PUB/ABH).

The NWI indicates that the Experimental Pool and its associated wetlands within the System are classified as follows:

- Palustrine, unconsolidated bottom/aquatic bed, permanently flooded (PUB/ABH).
- Palustrine, scrub-shrub, broad leaved deciduous, seasonally flooded (PSS1C).
- Palustrine, forested, broad leaved deciduous/needle-leaved evergreen, saturated (PF01/4B).
- Palustrine, forested, broad leaved deciduous, seasonally flooded (PF01C).
- Palustrine, forested, broad leaved deciduous, saturated (PF01B).
- Palustrine, emergent, persistent, semipermanently flooded (PEM1F).

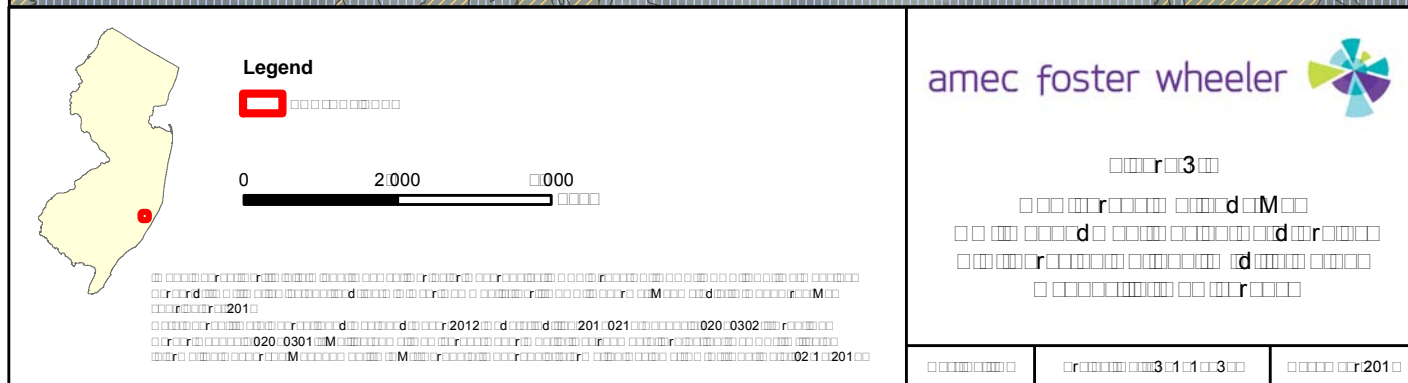
The NWI indicates that the western pools and their associated wetlands within the System are classified as follows:

- Lacustrine, littoral, emergent, seasonally flooded (L2EMC).
- Lacustrine, littoral, unconsolidated bottom, permanently flooded (L2UBH).
- Lacustrine, littoral, unconsolidated shore, seasonally flooded (L2USC).
- Estuarine, subtidal, unconsolidated bottom, subtidal (E1UBL).

The NWI indicates that the East Pool and its associated wetlands within the System are classified as follows:

- Estuarine, intertidal, emergent, persistent, irregularly flooded (E2EM1P).
- Estuarine, intertidal, emergent, persistent, irregularly flooded, partially drained/ditched (E2EM1Pd).
- Estuarine, intertidal, emergent, persistent, regularly flooded (E2EM1N).
- Estuarine, subtidal, unconsolidated bottom, subtidal, excavated (E1UBLx).

The NJDEP indicates that the western pools and their associated wetlands within the System are classified as follows (**Figure 3.4**):



- Tidal rivers, inland bays, and other tidal waters.
- Saline marsh (low marsh).

The NJDEP indicates that the East Pool and its associated wetlands within the System are classified as follows:

- Saline marsh (low marsh).

3.3 Biological Environment

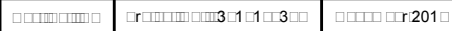
3.3.1 Vegetation

Wetlands are the dominant community type on the refuge, with salt marsh making up the largest component of the wetlands community type. Forested areas compose a relatively smaller portion of the refuge, including both forested wetlands and forested uplands. A habitat evaluation/characterization was performed by Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec) on July 28, 2015 to identify vegetation community types in the Project area. The following resources were consulted as part of this characterization: *Classification of Wetlands and Deepwater Habitats of the United States* (USFWS 1979); *Classification of Vegetation Communities of New Jersey: Second Iteration* (Breden et al. 2001), and *Plant Communities of New Jersey* (Collins and Anderson, 1994). As part of the biological characterization of the Project Area, Amec developed a vegetation community map of the Project area (**Figure 3.5**).

The on-site survey revealed that the wetland vegetation community distribution is particularly evident in the Project area, characterized by expansive salt marshes and freshwater marshes extending eastward towards the barrier island bays, with relatively smaller areas of wooded communities (and oldfields and scrub-shrub uplands) located primarily along the western edge of the Project area. As intended by the Service, the East and West Pools exhibit tidal marsh and freshwater marsh communities, respectively. Salt marsh surrounds the entire impoundment system and composes the East Pool, whereas freshwater marsh composes the West Pools, portions of the Experimental Pool, and the shorelines of Gull Pond and Lily Lake.

The expansive marshes surrounding the impoundment system exhibit a typical salt marsh community zonation in relation to elevation. That is, lower elevations subject to twice-daily tidal inundation are either open water at high tide, mud-flat at low tide, or are dominated by smooth cordgrass (*Spartina alterniflora*). Areas slightly higher in elevation are dominated by saltmeadow cordgrass (*Spartina patens*), with salt meadow rush (*Juncus gerardii*), saltgrass (*Distichlis spicata*), and glasswort (*Salicornia* sp.) present in abundance. Most of the high marsh in the Project area is dominated by marsh elder (*Iva frutescens*).

The East Pool is subject to tidal action moving through WCS #1, #3, #4 and #5. As such, the resulting vegetation community mirrors the salt marsh to the outside of the impoundment system. The East Pool contains a large number of islands that are vegetated in the same pattern with regards to elevation. Islands at low elevations that are subject to tidal inundation are dominated by



saltmarsh cordgrass, with higher elevation islands dominated by salt hay, and subsequently higher elevations dominated by shrubs, presumably marsh elder. (A close examination of the exact shrub species was not performed for the islands.)

The vegetation community within the immediate vicinity of WCS #3 is only slightly different from the surrounding community due to the presence of patches of common reed. This difference is likely the result of previous land disturbance from the construction of the water control structure. At the Dogleg area, the vegetation community indicated the results of erosive action on the shoreline. At low tide, the intertidal zone is an unvegetated flat of fine sand and silt which changes abruptly to an upland slope, with the toe of slope in some areas exhibiting signs of localized erosion.

Based on the *Classification of Vegetation Communities of New Jersey* (Breden et al. 2001), the smooth cordgrass-dominated low marsh within the observed saline/estuarine vegetation communities is classified as a Saltmarsh Cordgrass Tidal Herbaceous Alliance; the saltmeadow cordgrass-dominated community is classified as a Saltmeadow Cordgrass – (Saltgrass) Tidal Herbaceous Alliance; and the high marsh is classified as a Groundsel tree – Maritime Marsh-elder Tidal Shrubland Alliance.

Freshwater marsh characterizes the West Pools. This vegetation community is a mosaic of wetland species, with large monotypic patches of species interspersed among each other. These species patches include areas dominated by a co-occurrence of common cattail (*Typha latifolia*) and swamp rose mallow (*Hibiscus moscheutos*), monotypic stands of common three-square (*Schoenoplectus pungens*), monotypic stands of water knotweed (*Polygonum amphibium*), and areas interspersed with common reed. Narrow-leaved cattail (*Typha angustifolia*) is also expected to occur in this community although this could not be confirmed during the site survey. Other abundant species in the freshwater marsh include deer-tongue grass (*Dicanthelium clandestinum*), poison ivy (*Toxicodendron radicans*), and grass-leaved goldenrod (*Euthamia graminifolia*), and various smartweeds (*Polygonum* spp.). The shorelines of Gull Pond and the Experimental Pools exhibited a similar species assemblage, but these water bodies also exhibited white water lily (*Nymphaea alba*) and water primrose (*Ludwigia* sp.) in the open water and nearshore zones.

As identified in the *Classification of Vegetation Communities of New Jersey* (Breden et al. 2001), the *Schoenoplectus pungens*-dominated areas of the observed freshwater vegetation community is classified as a Threesquare Tidal Herbaceous Alliance. Although the site survey identified common cattail to be the dominant cattail in the cattail-swamp rose mallow association, it is presumed that narrow-leaved cattail is also present. Breden et al. (2001) reports a Narrowleaf Cattail – Eastern Rose Mallow Herbaceous Vegetation alliance that otherwise closely matches the observed community.

The description of upland communities in the Project area is limited to the vegetation around the dikes and does not include the areas farther to the west, which include oldfield and other actively-managed early-successional communities (e.g., the hydro-axed areas for wildlife habitat), and the mixed forest. The upland vegetation around the dikes is similar to a roadside community dominated by ruderal (plants that grow in waste places, along roadsides or in rubbish) and early successional species such as bitter panicgrass (*Panicum amarum*), goldenrod (*Solidago* sp.), bush

clover (*Lespedeza* sp.), switchgrass (*Panicum virgatum*), green foxtail (*Setaria viridis*), and Allegheny blackberry (*Rubus allegheniensis*). **Appendix D** presents a list of all plant species observed in the Project area.

3.3.2 Fish

Able (1992) reports that the marine ichthyofauna (fish) of New Jersey consists of 336 species represented by 116 families which occur from the upper limits of saltwater intrusion in the estuaries (including Delaware Bay) to the 200-meter (656.2-foot) contour at the edge of the continental shelf. GeoMarine, Inc (GMI; 2009) notes that various inshore (estuaries, bays, saltmarshes, tidal creeks, and coastal beaches), and offshore environments (sand ridges, continental shelf, canyons, hard bottom), as well as artificial reefs (ship wrecks and man-made structures) along the New Jersey coast line are important to fish and fisheries. Sherman *et al.* (1996) report that a high proportion of fish species within the coastal New Jersey environment are seasonal, while few (less than 5 percent) are year round residents.

Refuge lands are bordered by, and are hydrologically connected to, estuarine habitats composed of saltmarshes, streams, ponds, bays, and rivers (USFWS 2013). In general, the Refuge is home to a rich variety of fish, shellfish, and crabs. These species are of significant importance to the sport and commercial fisheries, as well as an important food base for many birds and mammals (USFWS 2004; USFWS 2013).

In the *Significant Habitats and Habitat Complexes of the New York Bight Watershed* report (USFWS 1997a), 59 species of fish were collected and reported during a one-year NJDEP study of the Brigantine Bay and Marsh Complex (Complex #4) which comprises the Project area. Atlantic silverside (*Menidia menidia*) composed the majority of the catch (52 percent) followed by bay anchovy (*Anchoa mitchii*), composing 36 percent. Other abundant species included spot (*Leiostomas xanthurus*), mummichog, striped killifish (*Fundulus majalis*), American sandlace (*Ammodytes americanus*), bluefish (*Pomatomus saltatrix*), white mullet (*Mugil curema*), weakfish (*Cynoscion regalis*), winter flounder (*Pleuronectes americanus*), smooth dogfish (*Mustelus canis*), windowpane (*Scophthalmus aquosus*), Atlantic menhaden (*Brevoortia tyrannus*), sheepshead minnow (*Cyprinodon variegatus*), striped mullet (*Mugil cephalus*), and northern pipefish (*Syngnathus fuscus*). Some species of shellfish were found to be sporadically abundant, such as northern quahog (*Mercenaria mercenaria*), softshell clam (*Mya arenaria*), blue mussel (*Mytilus edulis*), and Eastern oysters (*Crassostrea virginica*).

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries (NMFS) Essential Fish Habitat (EFH) mapper (NOAA 2015) was consulted to determine which fish species habitat is mapped on and immediately adjacent to the Project site to assess their potential of being affected by the Proposed Action. The results are listed in **Table 3.1** below:

Table 3.1 EFH On and Immediately Adjacent to the Project Area based on the EFH Mapper						
Common Name	Scientific Name	Life Stage	Outside of Impoundments (e.g, Turtle Cove Beach and Dog-Leg)	Inside of Impoundments	Ground or Pelagic	Habit
Clearence skate	<i>Raja eglanteria</i>	Adult	X		Ground	Seasonal
Sandbar shark ¹	<i>Carcharhinus plumbeus</i>	Neonate Juvenile Adult	X X X	X X X	Ground Pelagic Migratory	Seasonal
Sand tiger shark ¹	<i>Carcharias taurus</i>	Neonate Juvenile	X X		Ground/Pelagic Ground/Pelagic	Migratory
Winter skate	<i>Leucoraja ocellata</i>	Adult	X		Ground	Year-round
Little skate	<i>Leucoraja erinacea</i>	Adult	X		Ground	Migratory
Windowpane flounder ²	<i>Scophthalmus aquosus</i>	Juvenile Adult	X X		Ground Ground	Year-round
Monkfish	<i>Lophius americanus</i>	Adult Eggs Larvae	X X X		Ground Ground Ground	Unknown
Red hake	<i>Urophycis chuss</i>	Adult Larvae Juvenile Eggs	X X X X		Pelagic Pelagic Pelagic Pelagic	Migratory
Albacore tuna ¹	<i>Thunnus alalunga</i>	Juvenile	X		Pelagic	Migratory
Bluefin tuna ¹	<i>Thunnus thynnus</i>	Juvenile	X		Pelagic	Migratory
Dusky shark ¹	<i>Carcharhinus obscurus</i>	Neonate	X		Pelagic	Migratory

¹ The EFH mapper qualifies this occurrence by stating, “The inland extents of this data layer were defined by medium resolution coastline data and may be subject to coastline artifacts. Interpretation of the seaward extents of EFH for this species could vary depending on the resolution of the data used to portray the depth ranges. This data layer uses medium to low resolution isobaths, which were considered appropriate to the level of uncertainty inherent in the data.”

² Reported by the NJDEP in USFWS (1997a) as abundant in the area.

Table 3.1 EFH On and Immediately Adjacent to the Project Area based on the EFH Mapper						
Common Name	Scientific Name	Life Stage	Outside of Impoundments (e.g, Turtle Cove Beach and Dog-Leg)	Inside of Impoundments	Ground or Pelagic	Habit
Scalloped hammerhead shark ¹	<i>Sphyrna lewini</i>	Juvenile	X		Pelagic	Unknown
Tiger shark ¹	<i>Galeocerdo cuvier</i>	Juvenile	X		Pelagic	Nomadic
Dusky Rockfish ³	<i>Sebastes ciliates</i>	ALL	X		Pelagic	Unknown
Smooth dogfish ^{1,2}	<i>Mustelus canis</i>	ALL	X		Pelagic	Migratory
Summer flounder	<i>Paralichthys dentatus</i>	Adult Juvenile Larvae	X X X		Ground Ground Ground	Migratory
Black sea bass	<i>Centropristis striata</i>	Juvenile Adult	X X		Ground Ground	Migratory
Scup	<i>Stenotomus chrysops</i>	Juvenile	X		Pelagic	Migratory
Longfin inshore squid	<i>Doryteuthis pealeii</i>	Juvenile Adult	X X		Pelagic Pelagic	Migratory Migratory
Bluefish ²	<i>Pomatomus saltatrix</i>	Adult Juvenile	X X		Pelagic Pelagic	Migratory Migratory
Atlantic butterfish	<i>Peprilus triacanthus</i>	Adult Juvenile	X X		Ground Ground	Unknown
Atlantic cod	<i>Gadus morhua</i>	Adult	X		Benthopelagic	Migratory

³ The EFH mapper qualifies this occurrence by stating, “This GIS data layer is a generalized interpretation of the textual definition of EFH, it does not fully represent the complexity of the habitats described in the designation. The textual description of EFH is always determinative of the presence or absence of EFH for this species.”

Habitat Areas of Particular Concern are also documented for the sandbar shark at the Project site and in Reed Bay, south of the site (NOAA 2015). **Appendix E** presents an EFH Assessment for this Project.

The NOAA Guide to Essential Fish Habitat Designations in the Northeastern United States was also consulted to identify additional EFH mapped near the Project area not listed by the EFH mapper. The associated 10' x 10' Square Coordinates list for the Project area covers a significantly larger area than the focused assessment associated with the findings using the EFH Mapper. Therefore, the likelihood of the following species being present in the Project area, as represented by the 10' x 10' Square Coordinates list, may be less than those indicated by the EFH mapper. The results are listed in **Table 3.2** below:

Table 3.2 Additional EFH Listed Near the Project Area based on 10' x 10' Square Coordinates				
Common Name	Scientific Name	Life Stage	Ground or Pelagic	Habit
Winter flounder	<i>Pseudopleuronectes americanus</i>	Eggs Larvae Juvenile Adult	Ground Benthopelagic Ground Ground	Year-round
Windowpane flounder	<i>Scopthalmus aquosus</i>	Eggs Larvae	Pelagic Pelagic	Year-round
Atlantic sea herring	<i>Clupea harengus</i>	Juvenile Adult	Pelagic Pelagic	Year-round
King mackerel	<i>Scomberomorus cavalla</i>	Eggs Larvae Juvenile Adult	Pelagic Pelagic Pelagic Pelagic	Migratory
Spanish mackerel	<i>Scomberomorus maculatus</i>	Eggs Larvae Juvenile Adult	Pelagic Pelagic Pelagic Pelagic	Migratory
Cobia	<i>Rachycentron canadum</i>	Eggs Larvae Juvenile Adult	Pelagic Pelagic Pelagic Pelagic	Migratory
Tiger shark	<i>Galeocerdo cuvier</i>	Larvae	Pelagic	Nomadic

3.3.3 Wildlife

Birds: The primary focus of the refuge has been to manage the tidal wetland and shallow bay habitat for migratory water birds. Thus, the Project area is replete with an abundant and diverse group of avian wildlife. The refuge's location in one of the most active flight paths of the Atlantic Flyway adds to the taxonomic richness and ecological importance of this area. Tens of thousands of migrating ducks, geese, shorebirds, and wading birds stop at the refuge each spring and fall to feed and rest. Some of these species, such as the American black duck (*Anas rubripes*), clapper rail (*Rallus crepitans*), and willet (*Tringa semipalmata*) breed at the refuge. The refuge is known for holding the largest concentrations of American black duck and Atlantic brant (*Branta bernicla*) on the Atlantic coast. Bald eagle (*Haliaeetus leucocephalus*) often forage over the open water areas, and osprey (*Pandion haliaetus*) and peregrine falcon (*Falco peregrinus*) nest on the man-made platforms. Large numbers of songbirds also use the upland habitats on the refuge to breed, rest, and feed (USFWS 2012a; USFWS 2014a; USFWS 2014b).

Some of the more abundant or common waterbirds and shorebirds found at the refuge include snow goose (*Chen caerulescens*), Canada goose (*Branta canadensis*), Atlantic brant, mallard (*Anas platyrhynchos*), American black duck, northern shoveler (*Anas clypeata*), bufflehead (*Bucephala albeola*), double-crested cormorant (*Phalacrocorax auritus*), great egret (*Ardea alba*), glossy ibis (*Plegadis falcinellus*), clapper rail, greater yellowlegs (*Tringa melanoleuca*), semipalmated sandpiper (*Calidris pusilla*), least sandpiper (*Calidris minutilla*), short-billed dowitcher (*Limnodromus griseus*), laughing gull (*Leucophaeus atricilla*), ring-billed gull (*Larus delawarensis*), herring gull (*Larus argentatus*), great black-backed gull (*Larus marinus*), Forster's tern (*Sterna forsteri*), and black skimmer (*Rynchops niger*) (USFWS 2012a; USFWS 2014a; USFWS 2014b).

Some of the above species are abundant or common throughout the year, whereas others, such as the snow goose are only present in very large numbers in the fall and winter. Canada goose, mallard, American black duck, great egret, glossy ibis, clapper rail, laughing gull, herring gull, great black-backed gull, Forster's tern, and black skimmer have been documented to breed at the refuge (USFWS 2012a; USFWS 2014a; USFWS 2014b).

Other abundant or common birds on the refuge include osprey, mourning dove (*Zenaida macroura*), red-bellied woodpecker (*Melanerpes carolinus*), blue jay (*Cyanocitta cristata*), fish crow (*Corvus ossifragus*), tree swallow (*Tachycineta bicolor*), barn swallow (*Hirundo rustica*), Carolina chickadee (*Poecile carolinensis*), tufted titmouse (*Baeolophus bicolor*), Carolina wren (*Thryothorus ludovicianus*), American robin (*Turdus migratorius*), gray catbird (*Dumetella carolinensis*), northern mockingbird (*Mimus polyglottos*), common yellowthroat (*Geothlypis trichas*), song sparrow (*Melospiza melodia*), northern cardinal (*Cardinalis cardinalis*), red-winged blackbird (*Agelaius phoeniceus*), common grackle (*Quiscalus quiscula*), American goldfinch (*Carduelis tristis*). All of these species have been documented to breed at the refuge (USFWS 2012a; USFWS 2014a; USFWS 2014b).

Mammals: There are over 30 species of mammals that occur on the refuge, characteristic of assemblages within MidAtlantic coastal communities. According to the Service's Comprehensive Conservation Plan for the refuge (2004), the following mammals can be found within the refuge:

Forest species include red fox (*Vulpes vulpes*), grey fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*), short-tailed weasel (*Mustela erminea*), striped skunk (*Mephitis mephitis*), opossum (*Didelphis virginiana*), white-tailed deer (*Odocoileus virginianus*), grey squirrel (*Sciurus carolinensis*), red squirrel (*Tamiasciurus hudsonicus*), chipmunk (*Tamias striatus*), white-footed mouse (*Peromyscus leucopus*), redbacked vole (*Clethrionomys gapperi*), pine vole (*Microtus pinetorum*), masked shrew (*Sorex cinereus*), short-tailed shrew (*Blarina brevicauda*), eastern mole (*Scalopus aquaticus*), and a variety of bat species.

Shrubland and grassland species of mammals include the meadow vole (*Microtus pennsylvanicus*), meadow jumping mouse (*Zapus hudsonius*), woodchuck (*Marmota monax*), eastern cottontail (*Sylvilagus floridanus*), and several of the forest and wetland species. Mammals associated with wetlands include mink (*Mustela vison*), river otter (*Lutra canadensis*), muskrat (*Ondatra zibethicus*), meadow vole, southern bog lemming (*Synaptomys cooperi*), and least shrew (*Cryptotis parva*).

Reptiles and Amphibians: There are a total of nineteen species of reptiles and amphibians that have been documented to occur on the refuge which fall into two major groups; Pine Barrens environment and coastal estuarine environment. The Proposed Action site would fall into the coastal estuarine community type assemblage which includes coastal marshes, estuaries, coves, tidal flats, and inner edges of barrier beaches. These habitats are utilized by important species such as the northern diamondback terrapin (*Malaclemys t. terrapin*) (USFWS 2004; USFWS 2013).

Upland habitat within the refuge is utilized by the commonly observed Fowler's toad (*Anaxyrus fowleri*) and the less frequently observed eastern spadefoot toad (*Scaphiopus holbrookii*) and wood frog (*Lithobates sylvatica*). Upland reptiles include the northern fence lizard (*Sceloporus undulatus*), northern pine snake (*Pituophis melanoleucus*), and eastern box turtle (*Terrapene carolina*). Salamanders, including the red-backed salamander (*Plethodon cinereus*), slimy salamander (*Plethodon glutinosus*), and marbled salamander (*Ambystoma opacum*), are found within wetland habitats throughout the refuge (USFWS 2013). An abundance of American toads (*Anaxyrus americanus*) and spring peepers (*Pseudacris crucifer*) were documented at the Project site during Amec's on-site survey.

Others reptiles that have been observed at the refuge include (NJ 2015; USFWS 2013):

- Five-lined skink (*Plestiodon fasciatus*)
- Black racer (*Coluber constrictor constrictor*)
- Black rat snake (*Pantherophis obsoletus*)
- Northern water snake (*Nerodia sipedon sipedon*)
- Eastern hognose snake (*Heterodon platirhinos*)
- Rough green snake (*Opheodrys aestivus*)
- Eastern ribbon snake (*Thamnophis sauritus sauritus*)
- Common snapping turtle (*Chelydra serpentina*)
- Eastern painted turtle (*Chrysemys picta picta*)

- Eastern mud turtle (*Kinosternon subrubrum subrubrum*)
- Redbelly turtle (*Pseudemys rubriventris*)

In addition, the following amphibians have been documented as present within the refuge by visitors (NJ A 2015):

- Green frog (*Rana clamitans melanota*)
- New Jersey chorus frog (*Pseudacris feriarum kalmi*)
- Northern cricket frog (*Acris crepitans crepitans*)
- Gray treefrog (*Hyla sp.*)
- Southern leopard frog (*Lithobates sphenoccephalus sphenoccephalus*)
- Northern red salamander (*Pseudotriton ruber ruber*)
- Four-toed salamander (*Hemidactylium scutatum*)

3.3.4 Threatened and Endangered Species

The Service's online Information, Planning, and Conservation (IPaC) system indicated the presence of the following federally listed threatened and endangered species on or near the Project site (**Table 3.3** below and **Appendix F**):

Table 3.3 Service's IPaC Findings for Potential Federally Listed Threatened and Endangered Species On or Near the Project Site		
Common Name	Scientific Name	Federal Status
Red knot	<i>Calidris canutus rufa</i>	Threatened
American chaffseed	<i>Schwalbea americana</i>	Endangered
Hirst brothers' panic grass	<i>Dichanthelium hirstii</i>	Candidate
Knieskern's beaked-rush	<i>Rhynchospora knieskernii</i>	Threatened
Swamp pink	<i>Helonias bullata</i>	Threatened
Northern long-eared bat	<i>Myotis septentrionalis</i>	Threatened

There were no critical habitats documented within the Project area. However, the Service's IPaC system indicated the presence of 28 migratory birds protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) that could potentially be moving through the Project area, including the following (**Table 3.4** below):

Table 3.4 Service's IPaC Findings for Potential Migratory Bird Species On or Near the Project Site	
Common Name	Scientific Name
American oystercatcher	<i>Haematopus palliatus</i>
American bittern	<i>Botaurus lentiginosus</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>

Table 3.4 Service's IPaC Findings for Potential Migratory Bird Species On or Near the Project Site	
Common Name	Scientific Name
Black skimmer	<i>Rynchops niger</i>
Black rail	<i>Laterallus jamaicensis</i>
Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>
Blue-winged warbler	<i>Vermivora pinus</i>
Fox sparrow	<i>Passerella iliaca</i>
Gull-billed tern	<i>Gelochelidon nilotica</i>
Horned grebe	<i>Podiceps auritus</i>
Hudsonian godwit	<i>Limosa haemastica</i>
Least bittern	<i>Ixobrychus exilis</i>
Least tern	<i>Sterna antillarum</i>
Lesser yellowlegs	<i>Tringa flavipes</i>
Peregrine falcon	<i>Falco peregrinus</i>
Pied-billed grebe	<i>Podilymbus podiceps</i>
Prairie warbler	<i>Dendroica discolor</i>
Prothonotary warbler	<i>Protonotaria citrea</i>
Purple sandpiper	<i>Calidris maritima</i>
Red knot	<i>Calidris canutus rufa</i>
Rusty blackbird	<i>Euphagus carolinus</i>
Saltmarsh sparrow	<i>Ammodramus caudacutus</i>
Seaside sparrow	<i>Ammodramus maritimus</i>
Short-eared owl	<i>Asio flammeus</i>
Snowy egret	<i>Egretta thula</i>
Upland sandpiper	<i>Bartramia longicauda</i>
Wood thrush	<i>Hylocichla mustelina</i>

The NJDEP NJ-GeoWeb website (NJDEP 2014) Landscape Project indicated the presence of the following State-listed threatened and endangered species on or near the Project site (**Table 3.5** below):

Table 3.5 NJDEP Landscape Project Findings for Potential State-Listed Threatened and Endangered Species On or Near the Project Site			
Common Name	Scientific Name	Federal Status	State Status
Great blue heron	<i>Ardea herodias</i>	Not listed	Special concern
Red knot	<i>Calidris canutus</i>	Threatened	Endangered
Gull-billed tern	<i>Gelochelidon nilotica</i>	Not listed	Special concern
Common tern	<i>Sterna hirundo</i>	Not listed	Special concern
Tricolored heron	<i>Egretta tricolor</i>	Not listed	Special concern
Little blue heron	<i>Egretta caerulea</i>	Not listed	Special concern

Table 3.5 NJDEP Landscape Project Findings for Potential State-Listed Threatened and Endangered Species On or Near the Project Site			
Common Name	Scientific Name	Federal Status	State Status
Yellow-crowned night-heron	<i>Nyctanassa violacea</i>	Not listed	Threatened
Glossy ibis	<i>Plegadis falcinellus</i>	Not listed	Special concern
Peregrine falcon	<i>Falco peregrinus</i>	Not listed	Endangered
Osprey	<i>Pandion haliaetus</i>	Not listed	Threatened
Cattle egret	<i>Bulbulcus ibis</i>	Not listed	Threatened
Sanderling	<i>Calidris alba</i>	Not listed	Special concern
Caspian tern	<i>Hydroprogne caspia</i>	Not listed	Special concern
Snowy egret	<i>Egretta thula</i>	Not listed	Special concern
Bald eagle	<i>Haliaeetus leucocephalus</i>	Not listed	Threatened
Black-crowned night-heron	<i>Nycticorax nycticorax</i>	Not listed	Threatened
Black skimmer	<i>Rynchops niger</i>	Not listed	Endangered
Long-eared owl	<i>Asio otus</i>	Not listed	Threatened
Cooper's hawk	<i>Accipiter cooperii</i>	Not listed	Special concern
Red-shouldered hawk	<i>Buteo lineatus</i>	Not listed	Special concern
Whimbrel	<i>Numenius phaeopus</i>	Not listed	Special concern

The Site was also listed as a non-breeding Shorebird Migratory Concentration Area. Since the NJDEP GeoWeb website is a preliminary screening tool, a formal written request was submitted to the NJDEP Natural Heritage Program to confirm the possible presence of these species. The August 11, 2015 findings of the Natural Heritage Program are presented in **Appendix F**. These results indicated the following additional animal species that have the potential to occur on or near the Project site (**Table 3.6** below):

Table 3.6 NJDEP Natural Heritage Program Additional Findings for Potential State-Listed Threatened and Endangered Species On or Near the Project Site			
Common Name	Scientific Name	Federal Status	State Status
Black rail	<i>Laterallus jamaicensis</i>	Not Listed	Endangered
Least tern	<i>Sternula antillarum</i>	Not Listed	Endangered
Pied-billed grebe	<i>Podilymbus podiceps</i>	Not Listed	Endangered
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	Not Listed	Threatened
Sedge wren	<i>Cistothorus platensis</i>	Not Listed	Endangered

The results also indicated that the northern diamondback terrapin (*Malaclemys terrapin terrapin*), which is tracked by the Endangered and Nongame Species Program, also has the potential to be on the Project site.

3.4 Cultural Resources

Pursuant to the National Historic Preservation Act (NHPA) (Section 106), Amec performed a file review at the offices of the NJDEP SHPO and the New Jersey State Museum. The objective of the file review was to assess the potential for the Proposed Action to impact archaeological, cultural, and historical resources, collectively termed here as historic properties. The search indicated there are no properties listed on the State or National Registers of Historic Places within the immediate vicinity of the Project area. However, there is a historic district listed as eligible for National Register Listing located approximately 0.36 miles to the west of the Project area. In addition, there are three recorded archaeological sites within the boundaries of the refuge near the Proposed Action area, as well as historic and prehistoric artifacts recovered in an area south/southwest of the Project area. **Appendix G** presents copies of reports associated with the areas surrounding the Project.

Wildlife Drive (formerly Great Creek Road) along the South Dike has been identified as a historic property. The roadway, and the South Dike beneath it, evolved from the historical alignment of the Brigantine Beach Railroad line, which was in service from 1889 to 1903. The South Dike originated from the elevated grade of the railroad bed. The historical significance and integrity of this historic property has not been evaluated, and its eligibility for listing in the National Register of Historic Places is undetermined. It is possibly eligible. The re-surfacing of Wildlife Drive (South Dike) with recycled concrete is a proposed component of the Project. Although the historic property may be eligible for National Register listing, re-surfacing of the existing roadway alignment (which has been done previously) would not alter the qualities of the historic property that make it significant. Consequently, the Project would not cause an adverse effect under NHPA (Sec. 106).

The impoundments were built in the 1950s/1960s for the purpose of creating freshwater or brackish waterfowl habitat. A review of historical aerial photographs indicates that the Project area historically contained salt marsh typical of the surrounding area. While the dikes and WCSs are more than fifty years old, these structures lack historical significance, with the exception of South Dike. This means they do not illustrate significant aspects of the properties prehistoric or historic period, and historical significance, meaning they are not important to the history, architecture, archeology, engineering, or culture of the surrounding community (NPS 2015). Consequently, these structures are not considered eligible for listing in the National Register of Historic Places.

The archaeological sensitivity of the Area of Potential Effects (APE) of the Project is low because of previous disturbances associated with the construction of the dikes and WCSs. Although historic and prehistoric artifacts were recorded within 180 feet of the intersection of Short Dike and South Dike, Project activities are not scheduled within this area, with the exception of resurfacing Wildlife Drive. The resurfacing activity does not involve soil movement or new ground alteration outside of the existing roadway alignment; therefore, the Project has no potential to affect objects

of archaeological significance. However, activities will be halted if any historic or prehistoric artifacts are unearthed during the renovations. If such an inadvertent discovery occurs, the Refuge manager will be contacted immediately. In consultation with the SHPO, the Service will determine the appropriate management actions that shall be completed before construction may resume.

The Project will not incur any changes to visual impacts on the nearby historic district as there are no structures being added to the viewshed.

3.5 Socio-Economic Resources and Environmental Justice

Atlantic County (the County) currently has seven target industries, including agriculture, aviation, casinos, healthcare, renewable energy, retail and tourism (ACNJ 2015).

Regarding agriculture, Atlantic County is now the second largest agricultural county in the State, producing crops and livestock worth \$128.3 million annually. The County contains 499 farms that produce crops on a total of 30,372 acres. These well-drained, sandy coastal plain farmlands provide fresh fruits and vegetables that are harvested at least 9 months of the year (ACNJ 2015).

In the field of aviation, the County has embraced twenty-first century technologies by creating the Stockton Aviation Research and Technology Park located at the Federal Aviation Administration's William J. Hughes Technical Center campus. This research facility is expected to advance aviation sciences (ACNJ 2015).

In the casino, healthcare, and renewable energy industries, leisure and hospitality accounts for the largest number of jobs in the County with a total of 46,156, largely due to the presence of Atlantic City's casinos. AtlantiCare, Shore Medical Center, and the Rothman Institute are the leading healthcare providers in Atlantic County. The Atlantic County Utilities Authority (ACUA) currently uses several renewable energy sources, including their wind farm, which generates an annual energy equivalent of 24,000 barrels of crude oil. This has earned Atlantic County the designation as the "Greenest County in New Jersey" (ACNJ 2015).

Tanger Outlets - The Walk, Hamilton Mall, and the Shore Mall lead the retail industry in the County and tourism is driven by the Atlantic City casinos, restaurants and hotels (ACNJ 2015).

The commercial fishing industry in southern New Jersey is also substantial. Important species for this industry include: finned fish (including bait fish), eel, clams, mussels, and crabs (including horseshoe crabs). In addition, there has been an increase in shellfish aquaculture, especially oysters (USFWS 2004).

3.6 Recreation

The refuge receives over 250,000 visitors per year who use the land for various recreational purposes such as hunting, fishing, environmental education, and wildlife observation. The New Jersey shore has long been a major tourist destination so the wildlife-dependent public use at the refuge is consistent with the tourism industry for the region (USFWS 2004).

The project area is used throughout the year to for hiking and birding by visitors to the refuge. Peak visitation to Wildlife Drive coincides with the arrival of birds during spring (March-May) and fall (August-November) migrations.

3.7 Transportation

The regional and State roads that convey traffic directly into and from Oceanville are as follows:

- The Garden State Parkway is a major arterial toll road running in a northeast to southwest direction.
- U.S. Highway 9 also runs in a general northeast to southwest direction, and is the principal arterial road that runs the length of New Jersey from Bergen County to Cape May County.

Average daily traffic volume for the section of the Garden State Parkway nearest the Project site was estimated to be between 28,961 and 33,510 cars per day for 2015 during the fall season (October). These values represent approximately 97% of the maximum daily load on this stretch of roadway which occurs during summer months (T&M 2000).

Traffic volumes on a stretch of U.S. Highway 9 just west of the Project area indicate that the roadway's average annual daily traffic volume at 9,180 cars per day in May of 2014 (NJDOT 2015).

Chapter 4 Environmental Consequences and Cumulative Impacts

4.1 Physical Environment

4.1.1 Topography

The Proposed Action involves the rebuilding, regrading or stabilization of eroded or damaged portions of the dikes within the System. Therefore, there will be unavoidable impacts to the local topography from the Preferred Alternative. However, these impacts will be minor and are not considered to be adverse. The Proposed Action will increase resiliency of the dike system and improve the refuge's ability to manage diverse habitat for migratory birds.

As the plan would be to locate Alternative 1a within the footprint of the Long Dike Breach to be repaired, implementation of this potential action would involve minimal earth disturbance but not to the degree to result in a significant adverse impact to the Project area local topography. Alternative 1b may not involve any earth disturbance. Therefore, none of these alternatives will result in an adverse impact to topography.

The No Action Alternative would result in continued erosion at high risk areas around the perimeter of the System and within the western pools. These prolonged erosional effects could have the potential to alter the local physical environment to the point where it could have an impact on Wildlife Drive in the future.

4.1.2 Geology and Soils

Although there will be temporary movement of soils during the Proposed Action activities, the soils existing within the System were originally disturbed when the dikes were first built. None of the Project activities involve changing soil composition. In addition, the Proposed Action does not require activities that extend down to surficial geological layers. Therefore, the Proposed Action will not have adverse impacts to the local or regional geology and soils.

Alternatives 1a and 1b will involve some minimal movement of soils; however, the small amount of soil disturbance would not result in an adverse impact to the Project area geology or soils.

The No Action Alternative would not result in impacts to the local or regional geology and soils.

4.1.3 Water Quality

The restoration of Long Dike will result in the localized movement of bottom sediments. The short-term impact on water quality in the area immediately surrounding the site activities will be minimal and temporary, as subsequent deposition of the suspended sediment will allow the impoundments to maintain the ecosystems they support.

The use of turbidity barriers and cofferdams to complete the various stages of work necessary for this Project will effectively reduce the amount of soils or sediments suspended from construction activities. In addition, the site soils are primarily sand in texture, so the limited suspension of

soils/sediments that may occur due to placement of these barrier structures should not result in any significant turbidity of the water.

Alternative 1a, and possibly Alternative 1b, will result in some local sediment disturbance but not to the degree to result in an adverse impact to the Project area water quality. Alternative 1c, as it is investigative in nature, will not result in any adverse impacts to water quality.

The No Action Alternative would not have an immediate impact on water quality in the System. However, failure to proceed with the Proposed Action could lead to increased turbidity within the System and surrounding estuaries from erosion of the dikes in the long term, causing damage to surrounding benthic and fish communities.

4.1.4 Air Quality

The Proposed Action and Alternatives 1a and 1b are not expected to have a significant environmental impact to air quality. Some temporary impacts are expected as the Proposed Action will involve emission-producing vehicles and machinery during construction. However, those emissions are predicted to be below SILs for all pollutants and averaging times for which a NAAQS or NJAAQS have been established. All on-road and non-road vehicles and machinery will be up-to-date in their registration and inspections, and thus compliant with current USEPA emission standards.

The No Action Alternative would not result in the use of any construction equipment; therefore, there would be no impacts to air quality.

4.1.5 Wetlands and Streams

The Proposed Action, Alternative 1a, and Alternative 1b will result in limited unavoidable disturbances to mapped coastal wetlands and State Open Waters. For the most part, the construction and management activities will take place in areas at the boundaries of mapped wetlands. The roadway resurfacing will occur on existing upland roadways and will not have any impact to wetlands. The repairs to Long Dikey, the placement of new riprap at the Dogleg section of North Dikey, and the replacement of WCS #3 will have limited intrusion into State Open Waters or coastal wetlands, but these disturbances are necessary to implement the Proposed Action. The riprap repairs in Turtle Cove will be conducted in areas that have been historically covered by riprap. The construction activities will not significantly impact biological resources (*i.e.*, plants, fish, and wildlife) due to the limited nature of the construction footprint and the planned protective measures (*i.e.* sediment and erosion control) that will be enacted during construction. Approval for the Proposed Action is currently being applied for by Amec from the NJDEP DLUR. Approval is anticipated because the action is considered to be compliant with the appropriate State regulations and rules for coastal wetlands and State Open Waters.

The No Action Alternative would not result in physical impacts to the wetlands and open water bodies. However, failure to proceed with the Proposed Action could lead to future inundation of the impoundments with saline water. This would change the wetland communities within the freshwater portion of the System, rendering them less valuable to migrating or overwintering birds.

4.2 Biological Environment

4.2.1 Vegetation

The Proposed Action will have unavoidable, but temporary, impacts to some vegetation species. The restoration armoring of North Dike and South Dike will require clearing and grubbing of approximately 31,500 square feet of vegetation within those areas to be repaired. Vegetation will also be impacted during excavation activities associated with Long Dike's repair. There are no mapped submerged aquatic vegetation areas in or near the Project area that would be impacted by Project activities.

After Hurricane Sandy, emergency repairs to the dike system were followed by seeding with stabilizing grasses and forbs, which were allowed to set seed for several years without mowing. The established seed bank and presence of ground stabilizing native grasses within and adjacent to project sites will help mitigate the temporary and unavoidable impacts of construction to vegetation. Living shorelines will be established at Turtle Cove and the Dogleg, where voids in riprap will be filled with sandy soil, seeded and planted with native species. Living shorelines are resilient to disturbance and provide greater habitat value than standard hard stabilization methods (RAE 2015).

Alternative 1a, and possibly Alternative 1b, will result in minimal vegetation disturbance but not to the degree to result in a significant adverse impact to the Project area vegetation.

The No Action Alternative would not result in any direct impacts to vegetation. However, erosion along the perimeter, if allowed to continue, could lead to future inundation of saline water within designated freshwater environs, eventually leading to altered plant species assemblage.

4.2.2 Fish

The Proposed Action will not have significant long-term environmental impacts to fish species or their habitat. In fact, the Proposed Action will result in the overall enhancement of the local environment. Enhancements will include the reduction of further erosion by the stabilization/repair of the dike areas that are currently classified as conditionally poor (Dogleg, Turtle Cove and area surrounding WCS #3) (SDE 2015). Reduction of erosion will protect fish eggs from being smothered during spawning. In addition, the repairs to the dikes and replacement of WCS #3 will allow the Service to regain water control throughout the System. This control will give the Service the ability to effectively modify the water regimes within the pools. This control will ensure the survival of the freshwater and salt marsh vegetative communities that serve as both a food source and protective cover for fish species within the System. In addition, there will be no change in size, nor conversion of existing water bodies/wetlands to that of a different salinity regime under the proposed alternative that could affect species assemblage within the System. The 919 acres of freshwater habitat will remain fresh, and the 536 acres of saltwater habitat will remain saline (**Table 2.1**).

There may be some minor sediment disruption of fish and/or shellfish habitat. However, these impacts are not considered significant and will be temporary in nature as the increase in turbidity during dike restoration activities is expected to be equivalent to that experienced during natural storm events. Coastal storms can increase turbidity as a result of sediments that have been re-suspended from shallow beds, from sediments eroded from beaches, as well as from sediment-laden river plumes (IADC 2015). The Proposed Action will suspend sediments from shallow beds and eroded areas, but it will have no effect on up-stream river sediment plumes. In addition, Project activities will not be conducted during spawning season to protect marine life (IADC 2015).

Alternative 1a, and possibly Alternative 1b, will result in minor localized but temporary disturbance to fish habitat, but not to the degree to result in an adverse impact to the Project area fish.

The No Action Alternative would not result in any direct impacts to fish or their habitat. However, indirect negative impacts would continue to be present as erosion along the perimeter, and the inability to manage the freshwater/saltwater balance would be detrimental to the ecological health of the surrounding fish habitats.

4.2.3 Wildlife

The Proposed Action will not have significant long-term environmental impacts to migratory birds or other wildlife species. The Proposed Action is expected to result in the overall enhancement of the local environment and migratory bird habitat. Stabilizing the Dogleg and Turtle Cove portions of the perimeter dikes will prevent further inundation of salt water into the predominantly freshwater western pools, thereby protecting the freshwater plants and animals that are saline intolerant. The restoration of the erosional areas along Long Dike will effectively separate the western impoundment into two separate freshwater wetland systems. This action, along with the replacement of WCS #3, would give the Service the ability to create differing wetland complexes (freshwater and saltwater) based on the needs of the wildlife in the area, to ensure their continued survival and use of the System. Although there may be some avoidance of the construction area by wildlife as a result of increased noise and human activity, these impacts are not considered significant and will be temporary in nature.

Alternative 1a, and possibly Alternative 1b, will result in minor localized but temporary disturbance to wildlife habitat, but not to the degree to result in an adverse impact to the Project area wildlife.

The No Action Alternative would not result in any direct impacts to wildlife in the area as no activities would be performed at the site. However, continued erosion of the perimeter dikes could lead to additional overtopping during tidal surges, reducing wetland complexity within the System and impairing freshwater dependent species. In addition, if Long Dike and WCS #3 are not fixed, the Service will not be able to control water flow within the System. This would preclude controlled water drawdowns and flooding used by the Service to mimic the dynamic water regime of some natural wetlands within the System. Waterfowl rely on these drawdowns at the peak of their spring migration to provide food (vegetation) and essential cover. If this food supply becomes

imperiled, migrating birds and other wildlife may, at the very least, be forced to abandon this area and look elsewhere for food. At the very most, it could affect wildlife survival rates.

4.2.4 Threatened and Endangered Species

There are three federally listed and one candidate plant species listed as having the potential to be on the Project site. None of these four species are expected to occur in, or within the vicinity of, the proposed work areas based on their preferred habitats. American chaffseed (endangered) is a perennial herb that grows in acidic, sandy or peaty soils in open pine flatwoods, seepage bogs, longleaf pine/oak sandhills, palustrine pine savannas, streamhead pocosins, pitch pine lowland forests, and transition areas between peaty wetlands and xeric soils (NatureServe 2008; USFWS, 2014c). Hirst brothers' panic grass (candidate species) is a perennial grass that grows in intermittently wet Coastal Plain habitats (usually intermittent ponds in savanna or pine barren habitats) (USFWS 2014d). These intermittent ponds are typically wet in the winter and spring, but dry during the summer and fall (USFWS 2012b). Knieskern's beaked-rush (threatened) is a perennial sedge, endemic to New Jersey that grows in early successional wetland habitats on relatively bare substrates, often in groundwater-influenced, fluctuating environments caused by human disturbance (USFWS 2014e, USFWS 1997b, USFWS 1993). It is highly intolerant of competition (USFWS 2014e). Swamp pink (threatened) is an evergreen wetland forb that grows in shady, forested wetlands, typically on hummocks in headwaters and spring seepages (USFWS 2014f). Although habitat for these plants may be present at other parts of the refuge, the actual location where work is proposed for this Project does not have habitat to support these species. Therefore, the Proposed Action will not have significant long-term environmental impacts to federally listed sensitive plant species.

The Proposed Action will also not have significant environmental impacts to Federal or State-listed threatened and endangered animal species. There may be some avoidance of the construction area by these species of concern as a result of increased noise and human activity; however, these impacts are not considered significant and will be temporary in nature. It is anticipated that the Proposed Action will result in the overall enhancement and naturalization of the local environment and threatened and endangered species habitat.

Alternative 1a, and possibly Alternative 1b, may result in some avoidance of the construction area by threatened and endangered species as a result of increased noise and human activity. However, these impacts are not considered significant and will be temporary in nature.

The No Action Alternative would not result in any direct impacts to threatened and endangered species, as no activities would be performed in the Project area. However, indirect negative impacts would continue to be present. Continued erosion of the dikes could lead to reduced wetland complexity and altered habitat species assemblage, making the System less desirable for certain species of concern that rely on freshwater wetlands specifically.

4.3 Cultural Resources

The Service has determined that the Proposed Action and Alternatives 1a and 1b will have no adverse effect on historic properties that are eligible for listing in the National Register of Historic Places.

The Project design avoids impacts to already documented archaeologically significant sites located within the refuge, near Project activities. If an inadvertent discovery of previously unrecorded cultural resources occurs during the construction phase, work will be halted immediately and the Refuge manager will be contacted. In consultation with the SHPO, the Service will determine the appropriate management actions that shall be completed before construction may resume.

The No Action Alternative would not have any impacts to cultural resources as no work would be performed in the Project area.

4.4 Socio-Economic Resources and Environmental Justice

The Proposed Action and Alternatives 1a and 1b are not expected to have any impact, adverse or beneficial, on race, gender, age class, or the area schools. It will also not affect the County's seven target industries. It does not include long-term construction of any facility that would increase the number of permanent jobs in Galloway Township or Atlantic County, nor will it have any impact on State or local tax revenue. Only minor, temporary, economic benefits may occur through on-site personnel spending at nearby restaurants, hardware supply stores, etc.

The No Action Alternative would not have any impacts on socio-economic resources as no work would be performed in the Project area.

4.5 Recreation

The Wildlife Drive portion of the HQ Impoundment System is used by visitors for wildlife-dependent activities. There is a potential for short-term effects on visitation to the HQ Project Area by the Proposed Action during construction (spring/summer 2016). This will be particularly true for the roadway resurfacing. The Service will make maximum use of public notification procedures, such as its website and Facebook page, to keep the public informed as to construction periods when access to the impoundment areas may be restricted. However, the long-term benefits to public recreation that would occur following the completion of the Proposed Action, as a result of the increased ability of the Service to manage water levels in the impoundments and restoration of the scenic Wildlife Drive, would off-set those short-term impacts from construction.

Alternatives 1a and 1b would not result in additional impacts to recreational visitation, as all the supplemental activities would occur in conjunction with the Proposed Action.

The No Action Alternative would not have any impacts on recreation as no work would be performed in the Project area.

4.6 Transportation

The Proposed Action and Alternatives 1a and 1b do not involve the building, removal, or repair of any major transportation infrastructure. Wildlife Drive is a small, local road surrounding the impoundments, used only by visitors to the refuge and by refuge staff. The resurfacing of this road during the Proposed Action will temporarily impact this transportation route, but would not be considered a significant impact to the surrounding community.

The scale of the Proposed Action and Alternatives 1a and 1b is also small, with minimal personnel required to complete the tasks (approximately five workers at one time). Personnel and vehicles would be required to travel along local roads leading to the refuge, such as Lily Lake Road and Great Creek Road. The use of these local roads by Project crew would also be minor and temporary. Therefore, the resulting increase in traffic on local infrastructure, capable of handling over 9,000 cars per day, would not be significant.

The No Action Alternative would not have any immediate impacts on infrastructure as no work would be performed in the Project area. However, the failure to resurface Wildlife Drive may have a significant impact in the future on the ability of visitors and staff at the refuge to be able to navigate around the impoundments safely.

4.7 Cumulative Impacts

A cumulative impact analysis must consider the potential impact on the environment that may result from the incremental impact of a project when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The methodology for performing such analyses is set forth in “*Considering Cumulative Effects under the NEPA*” (CEQ 1997), and includes the following:

1. Identification of the geographic area in which effects of the project may be felt
2. Assessment of the impacts that are expected in that area from the project
3. Identification of other actions (past, present, and reasonably foreseeable) that have had or are expected to have impacts in the same geographic area
4. Assessment of the impacts or expected impacts from these other actions
5. Assessment of the overall impact that can be expected if the individual impacts are allowed to accumulate

The geographic area for the assessment of cumulative impacts from the Proposed Action was largely identified as the Reeds Bay/Absecon Bay and tributaries, the Great Bay/Mullica River (below Garden State Parkway bridge), and the Atlantic Coast (Little Egg to Absecon) watersheds. These watersheds include the municipalities of Galloway Township, Atlantic City, Absecon City, Brigantine City, and Little Egg Harbor Township. All of these municipalities are located in Atlantic County with the exception of Little Egg Harbor Township, which is located in Ocean County. Little Egg Harbor Township and Absecon City were not included in the geographic area of this cumulative impacts assessment as only small portions of the HQ Impoundments’ drainage occurs within these municipalities.

Significant changes were made to the aquatic environment by the construction of the HQ Impoundment dikes and WCSs in the 1950’s and 1960’s. Additionally, due to habitat loss from development, the watershed has increased impervious surface area resulting in an increase in stormwater quantity and a subsequent decrease in stormwater quality. The Proposed Action is intended to provide long-term improvement to the environment through restored wetlands management.

While the Project is underway, the Service will be constructing a new administration building in the space/parking lot adjacent to the current HQ facilities. Plans include the construction of a 5,275 square foot office/administrative space for refuge staff and volunteers, a 1,700 square foot addition to the existing Visitor Information Center to be used as a multipurpose room, and a new office/administrative space (approximately 7,250 square feet) for the Service's New Jersey Field Office (NJFO) and Office of Law Enforcement (OLE). Stormwater and septic facilities would be constructed and landscaping, sidewalks, and rehabilitation or expansion of parking areas would be included. The proposed areas of development have been the location of various facilities for decades. In the 1940s, a maintenance shop was constructed at the location of the proposed refuge staff/volunteers building. It was demolished in 1981 and the area is now covered in grass and other vegetation. The proposed NJFO/OLE office would be constructed on an area that is kept as a mowed lawn/turf. New staff parking would overlay the current parking lot, and stormwater and septic would be constructed in areas that are currently kept as mowed lawn. It is estimated that construction would commence in winter 2015/2016 with a length of 12 months. The Proposed Action will not interfere with this scheduled development, nor will it induce further development, land use change, or other external pressure to the Project area.

A review of the readily available *Township of Galloway Atlantic County, New Jersey Master Plan* (Mott Associates 2001) and the *Atlantic City Tourism District Master Plan Volume 3* (CRDA 2012), revealed that there are no known present or future projects which are anticipated to impact or be impacted by the Proposed Action.

A review of the *Atlantic County Master Plan* (ACDRPED 2000) did not reveal any potential conflicts between the Proposed Action and future planned activities for the County. The Master Plan presents a number of improvements, past and planned, to the Garden State Parkway, the Atlantic City Expressway, and other major roadways and transportation infrastructure, none of which are anticipated to adversely affect or be affected by the Proposed Action.

In summary, there will not be any significant cumulative adverse environmental impacts from the Proposed Action and Alternatives 1a and 1b of the HQ Impoundment Design/Build Project when considered together with other past, present, and reasonably foreseeable future projects in the area. A Draft Findings of No Significant Impact (FONSI) has been included as **Appendix H** to this EA.

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Chapter 6 List of Preparers

This Environmental Assessment was prepared by Amec Foster Wheeler and reviewed by the Service (lead agency), Edwin B. Forsythe National Wildlife Refuge, Oceanville, New Jersey.

APPENDIX A
PHOTOGRAPHS



Photo 1

Entrance to the Wildlife Drive portion of the Refuge.



Photo 2

***Spartina patens* (salt hay) marsh around Leeds Eco Trail boardwalk, south of the HQ Impoundment System.**

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Photo 3

View of the *Spartina patens* marsh from the Leeds Eco Trail boardwalk, exhibiting a man-made ditch, high marsh ridge, and a tidal creek.



Photo 4

General view of *Spartina patens* marsh, south of the HQ Impoundment System.

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Photo 5

Oldfield community located off the southwest corner of the HQ Impoundment System.



Photo 6

General view of the bay-side salt marsh community, located on the other side of Wildlife Drive from the Southwest Pool.

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Photo 7

General view of the bay-side salt marsh community and Wildlife Drive, south of Turtle Cove, facing southeast.



Photo 8

General view of the bay-side salt marsh community by Water Control Structure #10 (WCS #10), facing southeast.

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Photo 9

General view of the bay-side salt marsh community, south of Turtle Cove, facing southeast.



Photo 10

Sand bar on the bay side of Wildlife Drive, south of Turtle Cove and the South Observation Tower - exposed at low tide and used as a resting spot by birds.

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Photo 11

Turtle Cove, facing west.



Photo 12

Turtle Cove, facing east.

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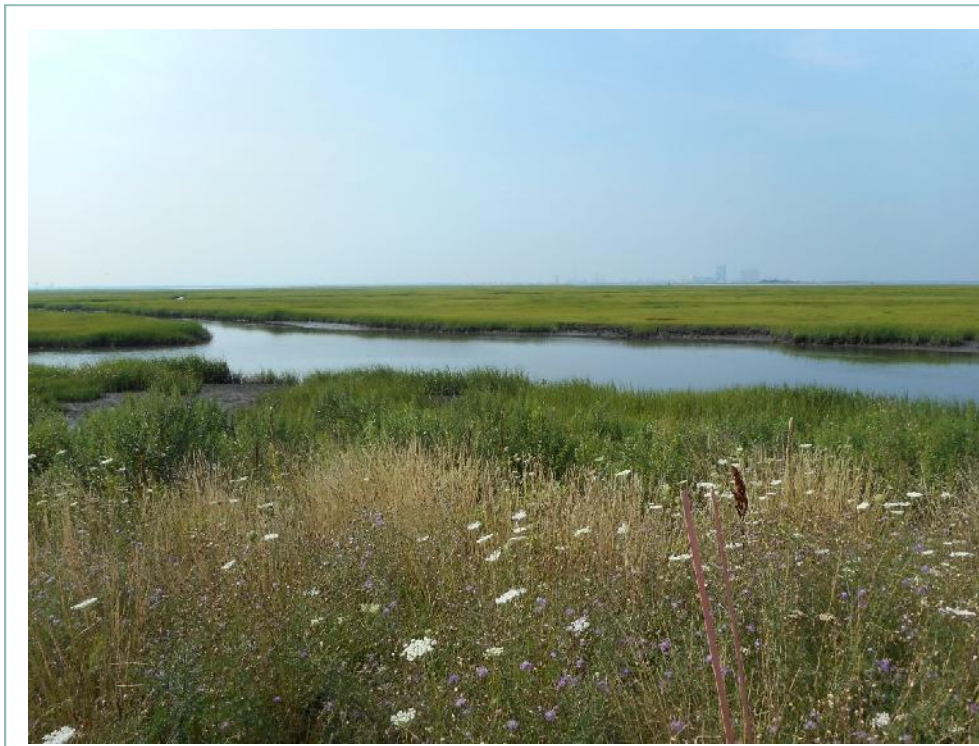


Photo 13

Bay side salt marsh, at the southeast corner of Wildlife Drive.



Photo 14

Bay side salt marsh along eastern edge of HQ Impoundment System.

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Photo 15

Zoomed-out view of WCS #3 on the bay side, facing southwest.



Photo 16

Exposed mud flat at low tide on the bay side, by WCS #3.

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Photo 17

WCS #3, bay side.



Photo 18

WCS #3, pool side.

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Photo 19

Bay side salt marsh, at the northeast corner of Wildlife Drive.



Photo 20

Eastern end of dog-leg area, facing southeast.

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Photo 21

Northern end of dog-leg area, facing north.



Photo 22

Zoomed-out photo of dog-leg shoreline, facing southeast.

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Photo 23

Zoomed-in photo of dog-leg shoreline, facing southeast.



Photo 24

Bay side salt marsh, opposite of the Northwest pool, showing Snow Goose eat out areas.

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Photo 25

General view of the East Pool (southwestern portion).



Photo 26

General view of the East Pool (south-central portion).

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Photo 27

General view of the East Pool (northeastern portion).



Photo 28

General view of the East Pool (southwestern portion).

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Photo 29

General view of the East Pool (central portion).



Photo 30

General view of the East Pool (northwestern portion).

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Photo 31

General view of the Northwest Pool (northeastern portion).



Photo 32

General view of the Northwest Pool (north-central portion).

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Photo 33

General view of the Northwest Pool (northwestern portion).



Photo 34

General view of the Northwest Pool (southeastern portion).

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Photo 35

General view of the Northwest Pool (east-central portion).



Photo 36

General view of the Northwest Pool (northeastern portion).

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Photo 37

General view of the Southwest Pool (western portion).



Photo 38

General view of the Southwest Pool (central portion).

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Photo 39

General view of the Southwest Pool (southeast portion by South Observation Tower).



Photo 40

General view of the northern end of the Cross Dike.

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Photo 41

Eastern end of the Long Dike, facing northwest.



Photo 42

General view of breach in the Long Dike.

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Photo 43

Experimental Pool.



Photo 44

**Doughty Creek at Lily
Lake Bridge, facing east.**

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Photo 45

**Lily Lake, viewed from
Lily Lake Bridge, facing
west.**



Photo 46

**Western end of the Long
Dike, viewed from the Gull
Pond Tower area, facing
east.**

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Photo 47

Northwest Pool, at the Gull Pond Tower area.



Photo 48

Long Dike, bisecting the West Pools, viewed from the Gull Pond Tower, facing east.

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APPENDIX B
PROJECT COMPONENTS

U.S. Fish and Wildlife
E.B. Forsythe HQ Impoundment
Construction Items and Estimated Quantities

Item No.	Work Item Description	Estimated Work Dimensions	Work Elements	Estimated Total Quantities
Recovery Bid Schedule 100 Items – Work to Be Completed By May 1, 2015				
102	Construct Armor (riprap) of Dogleg Section of North Dike	Maximum anticipated extent of work: 870 ft long x 52 ft wide = 45,240 SF	<ul style="list-style-type: none">• Install turbidity barrier• Clear and grub dike slope• Excavate an anchor trench at the toe of slope armor 2 to 3 feet wide by 2 to 3 feet deep, located at mean low water line. (Excess soils generated from the anchor trench will be re-used during shoreline re-grading)• Re-grade the dike slope to establish a 5H to 1V slope 9approx existing slope).• Fine grade and install Mirafi FW-404 woven geotextile, or equal over 45,240 SF area below riprap.• Place an 18-inch thick layer of riprap (approx. 6-inch to 12-inch sized stone).• Place sandy soil over riprap (“soil choking”) to fill voids and provide a planting medium for seeds and plants. This process will be performed in three stages to ensure voids are filled)• Seed with native mix at 15 pounds/acre• Install herbaceous plugs and potted shrubs•	<ul style="list-style-type: none">• 1,070 feet turbidity barrier• 45,240 SF – clear and grub• 150 to 350 CY toe excavation• 45,240 SF – textile• 25,000 CY – riprap• 500 CY – vegetative soil• Seed & mulch 45,240 SF (~60 pounds seed)•
103	Construct Armor (riprap) of Turtle Cove Section of South Dike – maintain beach – install riprap berm in front of beach and repair berm slope	Maximum anticipated extent of work: 3,000 ft long x 53 ft wide = 159,000 SF	<ul style="list-style-type: none">• Install turbidity barrier• Clear and grub dike slope• Temporarily remove approximately 800 CY of existing riprap and reclaim for reuse• Excavate an anchor trench at the toe of slope armor 2 to 3 feet wide by 2 to 3 feet deep, located at mean low water line (Excess soils generated from the anchor trench will be re-used during shoreline re-grading)• Re-grade the shoreline to establish a 5H to 1V slope (approx. existing slope)• Fine grade and install Mirafi FW-404 woven geotextile, or equal, or equal over 159,000 SF area below riprap.• Place a 24-inch thick layer of riprap (9-inch to 15-inch sized stone).• Place sandy soil over rip rap (“soil choking”) to fill voids and provide a planting medium for seeds and plants. This process will be performed in three stages to ensure voids are filled.)• Seed with native mix at 15 pounds/acre• Install herbaceous plugs and potted shrubs•	<ul style="list-style-type: none">• 700 feet turbidity barrier (500’ segments)• 159,000 SF – clear and grub• 159,000 SF – fine grading and prepare slope subgrade• 500 to 900 CY toe excavation• 159,000 SF – textile• 11,800 CY – riprap• 413 CY – soil• Seed & mulch 45,240 SF (~210 pounds seed)

Item No.	Work Item Description	Estimated Work Dimensions	Work Elements	Estimated Total Quantities
Resiliency Bid Schedule 200 Items – Work to Be Completed By October 31, 2016				
203	Construct re-surface (cap) approximately 6 miles of Wildlife Drive	Approximately 31,680' long x 18' wide = 570,240 SF	<ul style="list-style-type: none"> Fine grade and prepare top of berm Install 2-1/2-inch (loose) recycled concrete (3/4-inch minus stone) 	<ul style="list-style-type: none"> 570,240 SF - Fine grade and prepare top of berm subgrade 3550 CY – 2-1/2-inch loose (~2-inch compacted) layer recycled concrete Proof-roll/compact recycled concrete surface
204	Construct Long Dike Repairs and Add New WCS#7A	<p>Repair approximate 580 ft gap/breach in Dike– top width 12' with 5H:1V side slopes x 4 feet high. Repair 3,220 feet of eroded dike slopes plus construct top of dike to allow refuge vehicle traffic. Total dike length is approximately 6,860 feet long (3,060 feet of dike that requires no repairs except placement of recycled concrete surface)</p> <p>Replace WCS#7 (inoperable) with new WCS#7A within limits of breach. WCS#7A to consist of 18-inch diameter conduit with drop structure inlets and stoplogs.</p>	<ul style="list-style-type: none"> Install coffer dam and dewater work segments Dike base preparation – muck excavation and geogrid (Tensar BX 1300, or equal) placement Place and compact berm fill – granular borrow embankment fill (fine to coarse sand, with 20% gravel and 20% silt) Top of dike surface – Install 2-1/2 inch (loose) recycled concrete (3/4-inch minus stone) over 6,860 linear feet of dike Cover slope surface with 2" vegetative/topsoil Seed slope with native marsh grass mix Install 50-ft long, 18-inch diameter conduit Install drop structure inlets each end of conduit Install stoplog, or similar, gate structure at each end of conduit 	<ul style="list-style-type: none"> 1300 feet aqua dam coffer dam (both sides of 580' dike breach) 30,160 SF – geogrid (Tensar BX 1300 or equal) on 580 feet long reconstructed section 188,000 SF – clear, grub, prepare dike crest and slope (repaired section plus portion of breach section) 167,440 SF – fine grade and prepare slope and crest subgrade (repaired section) 8,250 CY total granular borrow volume consisting of 5,500 CY (repair volume), plus 2,750 CY (reconstruct volume) – granular borrow to consist of fine to coarse SAND, with 20% gravel and 20% silt 635 CY 2-1/2 inch loose (~2 inch compacted) layer recycled concrete tope of dike over 6,860 linear feet of dike 2,050 CY – vegetative soil Seed & mulch 167,200 SF (~120 pounds of seed)
205	Construct repair/replacement of East Dike Water Control Structure #3 (WCS#3)	Replace existing water control structure. Install up to two 8' by 4' culverts. Install new flap gates on outboard side and stoplog gates on inboard side.	<ul style="list-style-type: none"> Install coffer dam and dewater work area Excavate dike for headwalls and culvert pipe Possible pile foundations (as shown in record drawings) Concrete headwalls each side of berm Culvert pipe through berm Stoplog gates Backfill headwall and pipe – reconstruct berm Slopes - Install 12-inch layer filter stone Slope- Install 24-inch layer riprap (18" to 6" stone) Top of dike surface – 6" of gravel 	<ul style="list-style-type: none"> 300 feet aqua dam coffer dams (150 ft each side) 300 CY dike excavation Possible pile foundation installation Concrete headwalls – 35 CY up to 124 feet (two culverts 62 feet long each) of box culvert pipe 2 hinged flap gates and Stoplog gates Stainless steel weir guides (angles) 20 CY of 12-inch layer filter stone 50 CY 24-inch layer riprap 20 CY gravel surface

APPENDIX C
STATEMENT OF WORK

STATEMENT OF WORK
for
Resiliency Project #37 – Restoring Coastal Marshes in New Jersey National Wildlife Refuges

DESIGN/BUILD
for
HQ IMPOUNDMENTS
at the
E.B. FORSYTHE NATIONAL WILDLIFE REFUGE
OCEANVILLE, NEW JERSEY

SECTION 1 - GENERAL REQUIREMENTS

1.01 SCOPE OF REQUIRED SERVICES

The Contractor shall provide design-build services as required within this Statement of Work (SOW) to prepare construction plans and to construct the measures necessary to restore and enhance the HQ Impoundments at the E.B. Forsythe National Wildlife Refuge Headquarters located near Oceanville, New Jersey (Appendix A, Figure 1). The E.B. Forsythe National Wildlife Refuge (Refuge) protects tidal wetlands and shallow bay habitats for migratory water birds. The Refuge's location in one of the Atlantic Flyway's most active flight paths makes it an important link in the vast network of national wildlife refuges. Information on the Refuge can be found at:

http://www.fws.gov/refuge/edwin_b_forsythe/

The overall goal of this project is to implement a new water management plan for a series of constructed wetlands, known as the HQ Impoundment System (System). The objective of the water management plan is to effectively meet migratory bird habitat needs, whether that is as freshwater or saltwater wetland habitat. The System consists of (Appendix A, Figures 2, 3 and 4):

- Northwest Pool
- Southwest Pool
- East Pool
- Lily Lake and
- Pools associated with the Short Dike

The System was constructed to create freshwater wetland habitat for migratory birds, particularly waterfowl, shorebirds and wading birds, and was managed as an entirely fresh system until the early 2000's. The East Pool was originally intended to be a freshwater impoundment but it never fully operated in that manner as it was difficult to deliver freshwater to its easternmost point. The East Pool impoundment was overtaken by the non-native plant Giant Reed (*Phragmites australis*), which significantly reduced habitat availability and viewing pleasure by the public. After spraying the area with herbicide for years with no improvement, the water control structures in the East Pool were permanently opened to tidal flow to eliminate the salt-intolerant Giant Reed.

The Northwest Pool and Southwest Pool make up the West Pool. Due to the volume of waterbird food produced in the West Pool, the Refuge is interested in maintaining it as a freshwater impoundment and managed as two impoundments. The dike that bisects West Pool (Long Dike) is non-functional as it has two breaches totaling approximately 450 linear feet.

Hurricane Sandy also damaged sections of the other dikes that create the System. Cross Dike divides the West Pool and the East Pool once contained two water control structures (WCS). WCS #8 was destroyed during Hurricane Sandy and was subsequently filled with soil. The other is silted in and is non-functional. Other damaged areas have been repaired to a degree, but the System is not at pre-Sandy condition and long-term resiliency depends upon developing and implementing a water management plan.

Besides Long Dike, other areas of particular concern are Turtle Cove, the northeast corner WCS#3 and the Dog Leg on the North Dike (all shown in Appendix A, Figure 3).

The work specified within this SOW includes all data collection and analysis to prepare the study report, prepare the final construction drawings and specifications, and construct the measures necessary to effectively operate the System for migratory bird wetland habitat needs (freshwater and/or salt water).

The Contractor shall collect all data necessary to develop and analyze alternatives, and recommend alternatives to manage the System for wetland-dependent migratory birds. The watershed drainage area includes lands outside the Refuge; however, all structures for water management including Lily Lake and dam are within the Refuge. The water management plan shall include recommendations for water control structure configurations (flow requirements, elevations, etc), locations, operation and maintenance.

The water management plan should be based on a water balance study of the HQ Impoundment System and its watershed. Specifically, the contractor should determine if the available freshwater flow in Doughty Creek will support freshwater habitat in the System, especially the East Pool. The water balance study shall include the following:

- Development of flow duration curves to show the percentage of time that flows in Doughty Creek are likely to equal or exceed the minimum levels necessary to sustain a freshwater habitat in the System, especially the West Pool.
- The monthly 99-, 90-, 85-, 75-, 50-, and 25-percentile flow-durations of the minimum 1-day daily flow will be developed using the procedures in the “*Regional Regression Equations for the Estimation of Selected Monthly Low-Flow Duration and Frequency Statistics at Ungaged Sites on Streams in New Jersey*” (<http://pubs.usgs.gov/sir/2014/5004>).
- Capacity curves relating the volume of water stored in each impoundment to water surface elevations at 0.5 ft intervals.
- Surface area/stage curves, relating the surface area of impounded water to the water surface elevation in each impoundment at 0.5 ft intervals.

Specific information on the low-flow characteristics of streams is essential to determine the habitat feasibility of managing the System as a freshwater habitat. The Contractor shall determine what types of native freshwater habitats known to naturally occur in this region of New Jersey may be supported by the above probabilities.

In addition to the low-flow evaluation of Doughty Creek, the Contractor shall evaluate the contribution of fresh groundwater into the System.

The predicted sea level rise (SLR) will be taken into account. The Contractor will determine the current elevations with respect to current and predicted mean high water (MHW) elevations. Local MHW is to be measured in the field from water level loggers that have been in place for at least one (1) month. The Contractor will evaluate the structural and non-structural components of the proposed alternatives in consideration of the “low,” “intermediate” and “high” potential rates of future SLR for both “with” and “without project” conditions. This range of potential rates of SLR is to be based on the latest recommendations and methodologies from USEPA, NOAA and the USACE. See:

- http://www.habitat.noaa.gov/pdf/slr_workshop_report_november_2011.pdf and
- <http://cpo.noaa.gov/Home/Home/AllNews/TabId/315/ArtMID/668/ArticleID/80/Global-Sea-Level-Rise-Scenarios-for-the-United-States-National-Climate-Assessment.aspx>
- http://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1100-2-8162.pdf

Low, medium and high sea-level rise rate scenarios shall be predicted at 5-year intervals for 50 years into the future from the start of the project. The Contractor shall recommend the SLR scenario to be used for preparing the alternatives analyses for CO approval.

The Contractor shall develop a water management model (e.g. Reservoir System Simulation (HEC-ResSim) using software developed by the U.S. Army Corps of Engineers, http://www.hec.usace.army.mil/software/support_policy.aspx) to simulate operations for managing flows to maintain the desired habitat. The model will be based on the approved recommended alternative.

The contractor will present the water management plan as part of the study report for review and approval prior to beginning any work on final designs. In addition to the water management plan, the study report shall include the following:

- the data collected for the water management plan
- the water balance study
- identified problems/challenges
- alternative solutions to those problems/challenges
- analysis of the alternative solutions including their costs
- any other pertinent findings and recommendations
- the recommended solutions and costs
- draft water management plan

Upon Contract Officer approval of the recommended solution the Contractor will finalize the study report by adding:

- conceptual design for recommended solution
- final water management plan
- estimated design and construction costs with timelines to complete the recommended solution(s).
- alternatives and analyses for use in the NEPA process.

Specific areas of concern to be addressed in this project include (but not limited to):

Recovery Project Tasks (the Recovery Bid Items must be completed and final payment made by May 1, 2016. Recovery Bid Items shall be bid, awarded, tracked, and invoiced separately from Resiliency Bid Items).

- Design and construct placement of riprap along approximately 1500ft of South Dike at Turtle Cove.
- Design and construct dike protection along approximately 600ft of North Dike at the Dogleg, incorporating living shoreline techniques.

Resiliency Project Tasks (Resiliency Bid Items must be completed and final payment made by October 31, 2016. Resiliency Bid Items shall be bid, awarded, tracked, and invoiced separately from Recovery Bid Items).

- Prepare a Water Balance Study to determine freshwater availability and prepare a Water Management Plan for appropriate management actions for the System.
 - The Water Management Plan is based on the water balance study and shall provide recommendations for water control structure configurations (flow requirements, elevations, locations, etc) and operation and maintenance.
- Design and construct the repair of approximately 450 linear feet of breaches and 1,550 linear feet of eroded areas along Long Dike, incorporating living shoreline techniques.
- Design and construct Long Dike to allow safe passage for refuge vehicles.
- Design and construct a water control structure for the East Pool as determined by the Water Management Plan (repair/replace WCS #3).
- Re-surface (cap) approximately six miles of the Wildlife Drive.

The Contractor shall re-surface (cap) approximately six miles of the Wildlife Drive, which runs atop the outer dikes (South, East and North dikes) of the HQ Impoundment System.

Material:	Recycled crushed concrete, comprised of a well graded blend of crushed recycled concrete (3/4 inch maximum size), with no more than 10% (by weight) of sand and fines, and containing no asphalt or metal.
Top width:	18 feet
Depth:	2-1/2 inches before compaction. The center of the roadway shall have a 4 inch crown above the roadway edge after compaction.
Compaction:	A minimum of three passes of placing and spreading equipment.

The Contractor shall visit the site to determine site conditions to develop the study report, project designs, and plans. It is expected that the Contractor will need to collect data for the study report and project designs.

1.02 PROPOSAL REQUIREMENTS

The Contractor shall provide a proposal that includes: a description of the proposed topography and bathymetry surveys, and the methodology for completing the water balance study and water management plan; a description of the proposed project study report (alternatives analysis); a description of the proposed design, materials, and equipment needed. The proposal shall include all items required to design and construct the project.

1.03 CONTRACTOR'S QUALIFICATION

A Contractor's Qualification Questionnaire must be executed and filed with the Contracting Officer prior to the Proposal Due Date. All proposals must include a qualification statement indicating previous successfully completed projects, and at least one (3) examples of previous work (reports, drawings and specifications). The Contractor (and/or their subcontractors) must have demonstrated experience in hydrology and hydraulics and designing and building wetland habitat projects.

1.04 GENERAL SITE DESCRIPTION

The HQ Impoundment System (Appendix A, Figure 2 and 3) was constructed in the late 1950 to early 1960 time period. Today the area supports use by wildlife and is considered one of the best wildlife-viewing areas on the East Coast of the United States, with over 100,000 visitors each year.

The System consists of three exterior dikes (North, South and East), and three internal dikes, Cross, Long and Short. Portions of the western edge of the system are bounded by

Gull Pond Tower Road, Short Dike, and natural landscape features (Figure 2). The base of the South Dike was the Brigantine Railroad for a short time around the turn of the last century. There are eight functioning water control structures in the system.

Currently, the impounded areas are divided into two pools: West Pool and East Pool. In the 1990's, Long Dike was constructed to bisect West Pool, but it has subsequently failed and does not function properly. Water flows from Lily Lake, which is owned by the Service, travels northward through Doughty Creek, and then flows into West Pool. The System was designed to then allow water to flow into East Pool, but there has been limited success over the years in creating freshwater impoundment in East Pool.

The System was constructed to create freshwater wetland habitat for migratory birds, particularly waterfowl, shorebirds and wading birds, and was managed as an entirely fresh system until the early 2000's.

1.05 SCHEDULES FOR PROJECT

- A. Within 15 days after receipt of notice to proceed from the Contracting Officer, the Contractor shall prepare and submit a proposed detailed schedule with milestones for all aspects of the project for review and approval by CO. Milestones should include the topography and bathymetry surveys, data collection, developing flow duration curves, water balance study, water management modeling, conceptual design, study report and final design phases at 30%, 60%, 90% progress review levels and completion.

A minimum of 14 days shall be allowed for all USFWS reviews. The timeline should also incorporate the required regulatory reviews and permitting, and any regulatory restrictions on time of year construction. The 60% design shall be used to begin the regulatory review process. The 90% design submittals shall incorporate all final regulatory requirements.

- B. Within 60 calendar days after receipt of notice to proceed from the Contracting Officer, the Contractor shall complete the topography and bathymetry surveys, data collection and development of flow duration curves.
- C. Within 120 calendar days after receipt of notice to proceed from the Contracting Officer, the Contractor shall complete the water balance study, the study report, including field data analyses and conceptual designs for review and approval.
- D. After the study report is approved by the Contracting Officer, the Contracting Officer will determine the specific project designs and related work to be installed, based on Refuge priorities and availability of funds. Those projects will then go to the final design construction phase.
- E. Within 180 calendar days after receipt of notice to proceed from the Contracting Officer, the Contractor shall complete designs and the water management plan.

- F. The timeframe for construction of **Recovery Bid Items** will be determined after the design is completed, and the extent of work is defined; however, **the Recovery Bid Items must be completed and final payment made by May 1, 2016. Recovery Bid Items shall be bid, awarded, tracked, and invoiced separately from Resiliency Bid Items.**
- G. The timeframe for construction of **Resiliency Bid Items** will be determined after the design is completed, and the extent of work is defined; however, **the Resiliency Bid Items must be completed and final payment made by October 31, 2016. Resiliency Bid Items shall be bid, awarded, tracked, and invoiced separately from Recovery Bid Items.**

1.06 BUDGET PARAMETERS

Total project price ranges between ranges between \$ 2,000,000.00 and \$ 2,400,000.00 dollars, which includes all data collection, analyses, modeling, maps, reports, construction, project management and oversight, and all contingencies. The proposal shall also include all costs associated with assisting FWS to obtain all permits.

Bonding and insurance, as required, shall be obtained by the Contractor. Davis-Bacon wages shall apply to this project.

SECTION 2 - DESIGN SERVICES

2.01 SCOPE OF DESIGN SERVICES

The Contractor shall visit the work areas described above to collect and obtain all information necessary to prepare: study report; water balance study and water management plan; final construction drawings and specifications and; construction costs with timelines to complete the work as defined in this statement of work.

The Contractor shall prepare a proposal and perform the work in two phases, as listed below:

1. Phase I- Design Services: The design phase shall chart the following sequence: investigative study of the area, topography and bathymetry surveys, data collection, developing flow duration curves, water balance study, water management modeling, study report and, approval of conceptual design, 60% review of study report and 30%, 60%, and 90% reviews of design, final approved design, cost estimate, construction drawings, construction and material specifications, operation and maintenance plan, and monitoring plan for the project. Design review meetings will be scheduled to coincide with these milestones. Permits will also be a part of the design phase. The

Contractor is responsible for identifying and preparing supporting documentation for the needed permits (see Section 2-C PERMITS for details). All permit applications shall be approved and signed by USFWS and be in the USFWS's name. No activity involving ground disturbing alteration or disturbance, including test pits or other activities subject to compliance with Section 106 of the National Historic Preservation Act (NHPA), may occur until the USFWS has obtained State Historic Preservation Office (SHPO) clearance and has consulted with the Tribal Historic Preservation Officers (THPOs) as appropriate.

The Contractor should assume in their proposal under design services that Phase 1 investigations requiring the staggered 8-meter interval shovel test grid are not required. During design the Contractor shall submit to the CO the location(s), type/methods and activities involving ground disturbing alterations or disturbances for geotechnical investigations or other Section 106 triggering activities. The FWS will use that information to obtain State Historic Preservation Office (SHPO) clearance and consult with the Tribal Historic Preservation Officer (THPO).

If any further study/investigations are needed to obtain SHPO clearance and consult with the THPO, the Contractor shall submit a request to the CO for a design cost adjustment. The request shall provide a detailed cost breakdown for the additional design services.

2. Phase II- Construction: Using the approved design and drawings, estimates, and specifications, the CO designated Recovery and Resiliency measures shall be completed. No construction shall occur until the USFWS has obtained State Historic Preservation Office (SHPO) clearance and has consulted with the Tribal Historic Preservation Officers (THPOs) as appropriate, and the Contractor has obtained all necessary permits for construction.

2.02 DESIGN REQUIREMENTS

1. The Contractor is responsible for obtaining the necessary information to properly analyze, design, and construct the project. The design must be engineered for the specific environment of the site, based on site-specific data, and existing site conditions. The Contractor is expected to take future conditions into account when designing projects (e.g. sea level rise projections over the next 50 years). The Contractor is responsible for all design and drawings detailing the project as well as all aspects of the construction work. The Contractor is responsible for the quality control of its own work and work performed by its subcontractors and their subcontractors.
2. Project design shall be in compliance with all applicable federal, State of New Jersey, and local standards and codes (see Permits, Section 2.C).

3. The Contractor shall perform all services necessary for FWS compliance with the National Environmental Policy Act (NEPA). The Contractor shall keep the COR informed at all times during the planning and design process and shall accompany the FWS at meetings. Although the Contractor will write the documents, the FWS will issue all the notices for preparing, commenting and final decision during the NEPA process. Permits will be filed and obtained under the USFWS.
4. The project costs shall include all expenses required for the project, including travel, lodging and meals, overhead costs, such as telephone, fax, in-house reproductions, and U.S. mailings.
5. All subsurface investigations, including geotechnical investigations, soil borings and test pit excavations, shall be performed by the Contractor, as required, to complete the design work. This work will be included as a part of the basic design fee.
6. All survey work required shall be performed by the Contractor. The Contractor shall conduct topographic and bathymetric surveys of the Wildlife Drive Wetland impoundment system (Northwest Pool, Southwest Pool, East Pool), Lily Lake, and marsh/pool area between Lily Lake and the impoundment system. The bathymetric survey shall include all dikes, water control structures, and impoundment bottoms. It is anticipated that elevation data for the survey will be collected using a variety of methods including, but not limited to, LiDAR, RTK GPS, and/or total station surveys. Bathymetric surveys will be referenced to NAVD 88 with an accuracy of at least 0.5 ft. All other elevations will be referenced to NAVD 88 with an accuracy of at least 0.2 ft. All information collected will be made available to CO in electronic format (Section D below).
7. Prior to construction, the Contractor shall prepare and submit written plans for:
 - a) Contractor construction inspection plan
 - b) Contractor construction quality control plan
 - c) Construction safety plan
 - d) Spill prevention and response plan
 - e) Preventing the Spread of Invasive Species: All equipment will be washed (following the best management practices (BMP) for washing described at <http://dnr.wi.gov/topic/Wetlands/documents/WetlandInvasiveBMP.pdf>) prior to arriving at refuge and prior to leaving the site to avoid cross contamination of the habitats.

2.03 PERMITS

1. The Contractor is responsible for all aspects of permitting necessary to complete the project. The Contractor shall obtain all information necessary to file permit applications necessary for construction. The Contractor is responsible for identifying permits required, preparing supporting documentation and accompanying FWS on any meetings, consultations and review of plans and documents with local, regional,

State and Federal agencies having jurisdiction over the project, as well as the public. Permits include the coordination and consultation regarding the National Historic Preservation Act (Sec. 106). The Contractor shall keep the COR informed at all times. Although the Contractor will write the documents, the FWS will issue all the notices for preparing, commenting and final decision during the NEPA process. The Contractor shall submit all applications and supporting documentation to the CO for approval prior to filing for permits. Permits will be filed and obtained under the USFWS name.

The Contractor shall, without additional costs to the Government, be responsible for obtaining all licenses and permits necessary to comply with Federal, State, and municipal laws, codes and regulations applicable to supplying labor, materials and all other support to construct the work. Included are any costs for licenses and permits necessary to disposal of excess or unusable materials.

2. The Contractor shall perform all services necessary to assist the USFWS to comply with the National Historic Preservation Act (Sec. 106). The Contractor will perform the background research, field investigations and prepare reports for USFWS use in coordinating with SHPO and consulting with the THPO. The cultural resource studies performed to assist compliance with the National Historic Preservation Act (Sec. 106) shall conform to FWS Region 5 and SHPO standards. FWS Region 5 standards are in Appendix E. The more stringent standard shall apply where there are any differences between the USFWS Region 5 standard and the SHPO standard. Prior to beginning any ground disturbing alteration or disturbance (including test pits) the Contractor shall prepare and submit a cultural resources plan to the CO for review and approval. The cultural resources plan will describe the Contractor's methodology to address compliance with National Historic Preservation Act (Sec. 106). Some preliminary administrative work has been conducted by refuge staff and will be made available to the Contractor.

2.04. PROGRESS SUBMISSIONS & FINAL DOCUMENTS

1. An on-site kick-off meeting will occur prior to the commencement of work. Written reports (pdf format) will be submitted at the end of each month and at least one week prior to a monthly conference call to review project status. All final products are due as specified in Section 1.05.
2. Drawings: Four (4) copies of to-scale Arch D Size (D Size) preliminary design drawings shall be provided for each design phase to the Government in AutoCAD 2011.DWG, ArcGIS, and pdf formats on CD-ROM disks, email, and hard paper copies.
3. Drawings: Four (4) copies of to-scale full size (E Size) final design drawings shall be provided to the Government in AutoCAD 2011.DWG, ArcGIS, and pdf formats on

CD-ROM disks, email, and hard paper copies. Copies of each drawing, stamped and signed by a New Jersey registered professional engineer, shall also be provided.

4. All written reports, memorandum, specifications shall be provided to the COR in electronic pdf formats on CD-ROM disks, email, and hard copy (4 copies) in Microsoft Word 2010 or later format. Construction and material specifications shall be provided on the same CD-ROM disk as the drawings, and shall be emailed, along with paper copies (4 copies).
5. Aerial Topographic Map – Digital (AutoCAD 2011.DWG and ArcGIS) and paper (3 copies @ 22"x34") data will be provided to the COR. Scale of the plats will approximate 1" = 500', and will include cross-sections of the following stations (referenced in page 77 of the SEED report and attached here): 20+00, 30+00, 40+00, 50+00, 60+00, 100+00, 140+00, 160+00, 190+00, 220+00, 230+00, 250+00 and 280+00. Contour intervals shall not exceed on foot. The study report submittals will include all aerial topography and bathymetry data, photography, field notes, survey notes, and supporting records for the final topographic maps.
6. Submit all map data in an ESRI Map Package shapefile format (ArcGIS 10.x) using Horizontal Datum; NAD 83, and Projection: UTM Zone 18N. Vertical Datum; NAVD 88. Metadata shall be formatted to FGDC Endorsed ISO Metadata Standards for spatial data.
7. Final submittals will include all basic data, photography, field notes, survey notes, and supporting records used for the analyses, modeling, study report, design (design report), construction drawings and specifications, and required plans. All computer models used will be submitted (for ownership by the FWS), with input and output files, user manual(s), notes and recommendations for updating.
8. Contractor shall follow Project Management Institute's (PMI), strategies, procedures, and tracking for the duration of the project. Contractor will establish and provide scope, schedule and cost baselines at the beginning of contract and track all progress and deviations against these baselines. Contractor shall use earned value management to track progress of the entire project as well as provide EVM reports, Pert, and Gantt charts as appropriate and provide monthly updates to the Contracting Officer, and when invoices are submitted. Deviations greater than +/- 5% from the approved baseline should also include corrective action strategies stating how the project will be brought back on track. Changes to the approved baseline must be approved by USFWS. Submittals shall be provided in electronic format and in the form of PDF and/or MS-Excel, Word, and Project 2011. Paper versions, in addition to electronic files are acceptable.

9. The Contractor shall mail design submissions consisting of reports, drawings, maps, and supporting documentation to the following persons (two (2) hard copies and one (1) electronic):

Freida McClain (2 copies)
Contract Specialist, Hurricane Sandy
Northeast Regional Office
U.S. Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035
(413) 253-8230
freida_mcclain@fws.gov

Virginia Rettig, Refuge Manager, COR (2 copies)
Edwin B. Forsythe NWR
Post Office Box 72
Oceanville, NJ 08231
(609) 652-1665
(609) 652-1474 (fax)
virginia_rettig@fws.gov

SECTION 3 - CONSTRUCTION

3.01 SCOPE OF CONSTRUCTION SERVICES

The Contractor shall construct the project per the design drawings and specifications approved by CO, and will provide construction administration.

A. Shop Drawings

1. The Contractor's Professional Engineer shall review all shop drawings during the construction phase of the project. FWS shall also review and approve shop drawings which will be submitted to the CO. The Contractor's Professional Engineer shall also review all materials to be incorporated into the project for conformance with the design and contract documents.

B. Project Meetings/Site Inspections

1. Project meetings/site inspections will be required based on project requirements. The Contractor's Professional Engineer shall routinely observe and inspect the construction activities, and advise the Government of any deviations, deficiencies or

solutions to issues discussed. (See Project Management reporting requirements above).

The Contractor's Professional Engineer shall follow each site visit with a report describing all discussions and findings. A site inspection report which includes the purpose of the inspection, items reviewed, deficiencies observed, recommendations and additional actions required, shall be furnished to the Government.

2. The Contractor's Professional Engineer will schedule with the CO/COR to conduct a final inspection when the project is complete. The Contractor's Professional Engineer shall prepare a final punch list for all deficient work noted, and correct the deficient work in collaboration with and under direction of the contracting office.
3. As-built drawings: Within 30 days of completion of construction and by the end of the period of performance, the contractor shall submit two (2) full size (Arch E Size) As-built copies of the construction documents representing the actual construction work completed.

C. Contractor Safety

1. The Contractor shall provide and maintain work environments and procedures which will safeguard the public and Government personnel, property, materials, supplies, and equipment exposed to Contractor operations and activities. A written safety plan will be submitted for review and concurrence prior to beginning work, including study report investigations. This includes a spill prevention and response plan.
2. Safety Regulations. The Contractor is responsible for ensuring that all on-site activities, equipment, and facilities constructed by the Contractor, subcontractor, or supplier conform fully to the standards of the Department of Labor, Occupational Safety and Health Administration (OSHA) 29 CFR 1926 and 1910.
3. Accident Reporting. The Contractor is responsible for reporting all accidents and injuries to the Contracting Officer (CO) or Contracting Officer's Representative (COR). Federal (including USFWS and OSHA), State, and local agencies have the right to conduct accident investigations if needed. In addition, the Contractor's safety record may be requested and reviewed before awarding a contract.

Appendix A

Figure 1 E. B. Forsythe National Wildlife Refuge Map

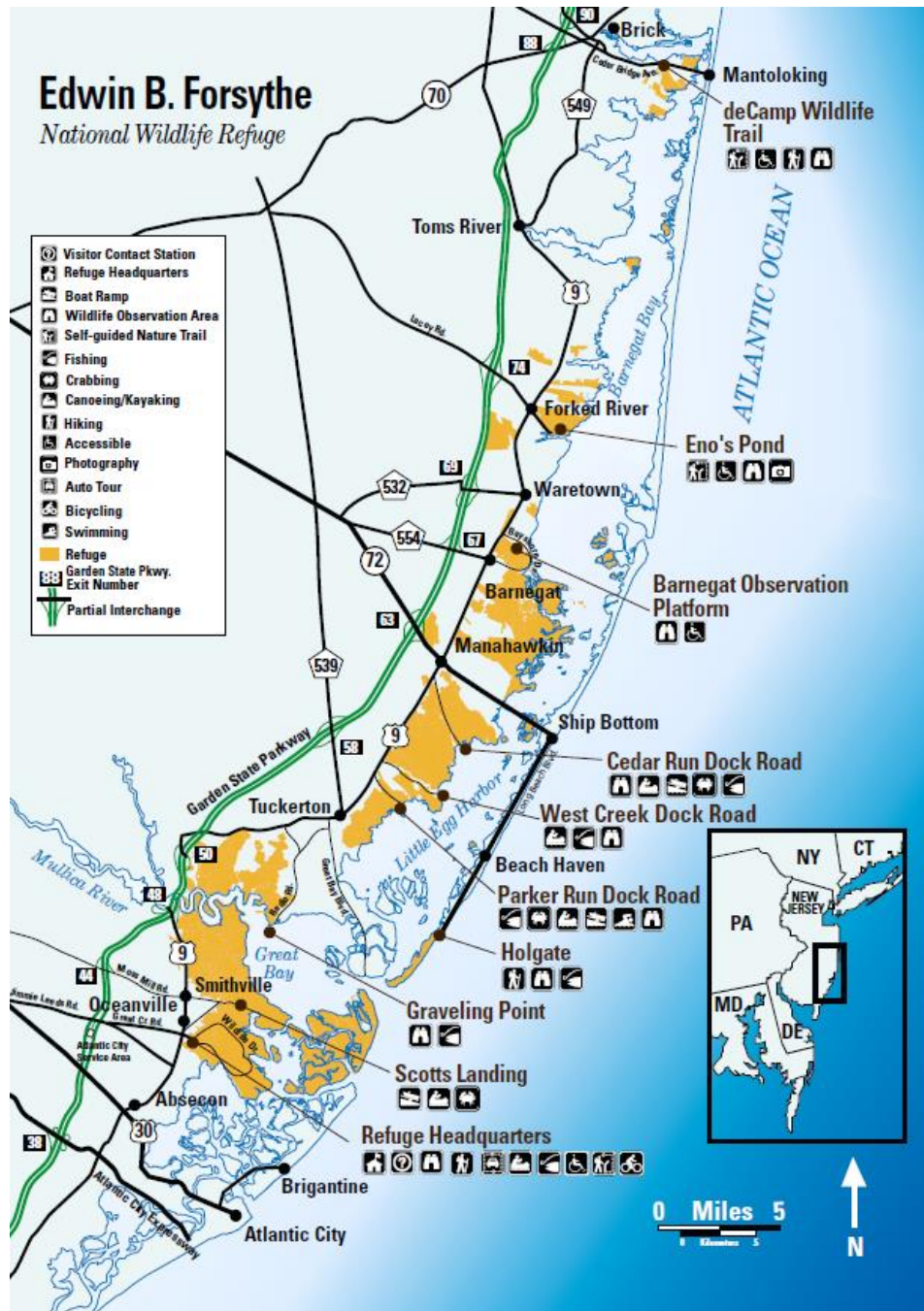
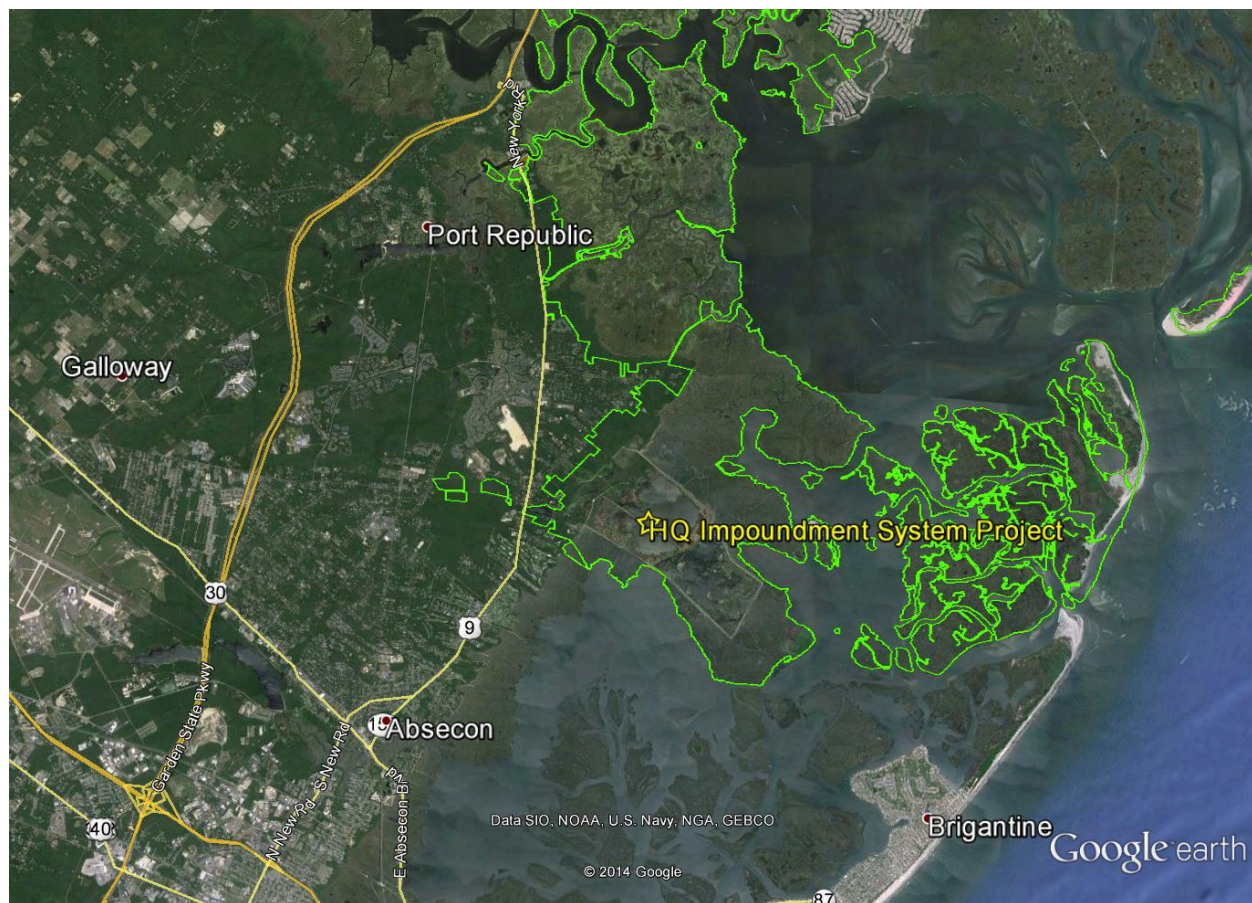


Figure 2. Location Map of System Project.

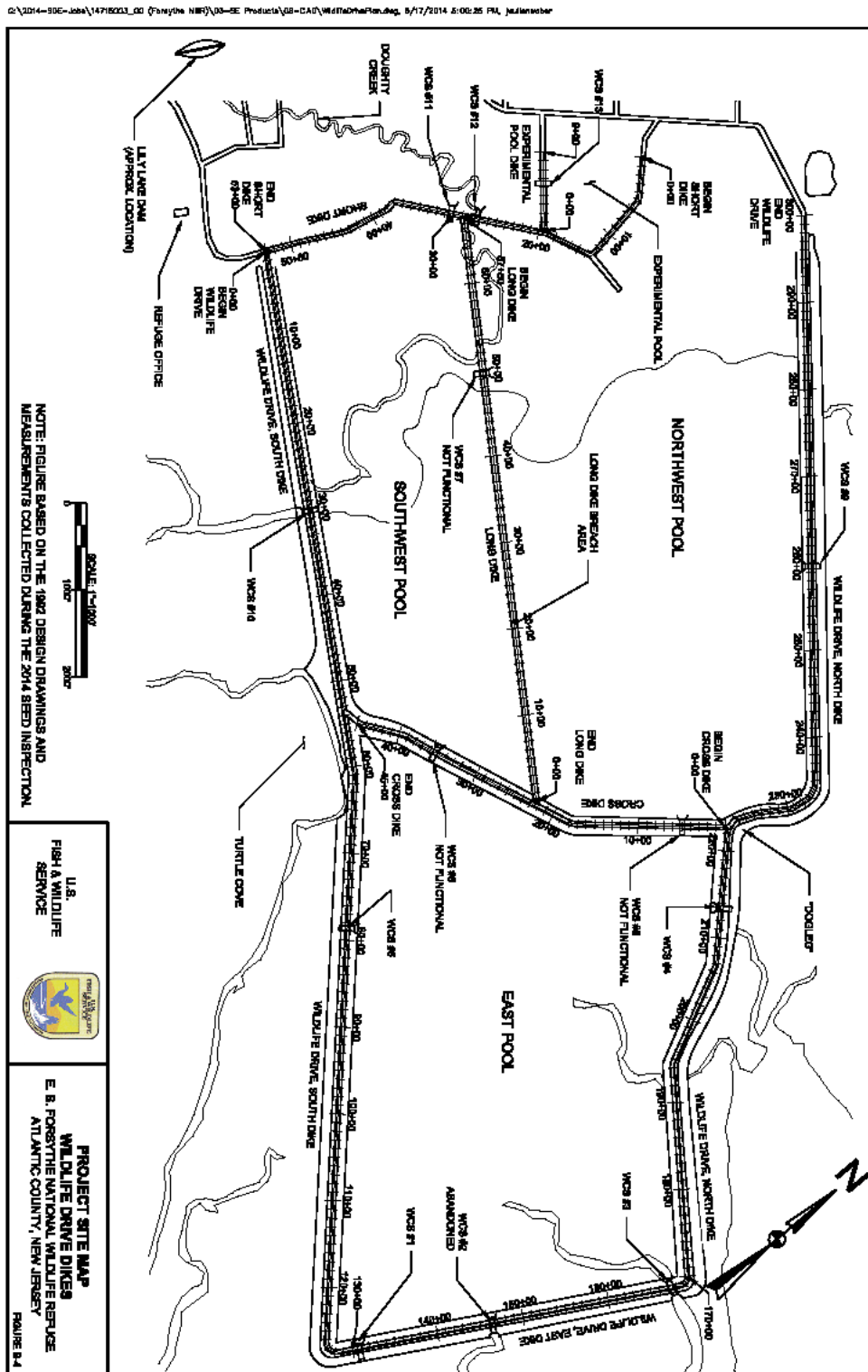


Appendix A

Figure 3. Map of Named Dikes in System at E.B. Forsythe NWR.



Appendix A
Figure 4. HQ Impoundments (Northwest Pool, Southwest Pool and East Pool)



STANDARDS FOR
ARCHAEOLOGICAL RESOURCE IDENTIFICATION STUDIES
ON REGION 5, U.S. FISH & WILDLIFE SERVICE LANDS

This Version: July 22, 2014

INTRODUCTION

The purpose of these standards is to ensure that archaeological resource identification studies on Region 5 (hereafter, the Region) U.S. Fish & Wildlife Service (Service) lands meet the performance standards required for studies done by the Regional Archaeological Staff or contracted by the Service. These standards apply to all non-Service entities in the Region, including private individuals, institutions, and corporations, as well as other federal, state, or local government agencies.

Performance to these standards is intended to ensure comparability and reliability of information on archaeological resources within Service property, and also to ensure that the Service's requirements for background data collection, sampling method and intensity, and material analysis and conservation are fully understood by Cultural Resource Management (CRM) consultants. The latter is particularly important if a Phase I CRM study is proposed as part of a project's National Environmental Policy Act (NEPA) and/or National Historic Preservation Act (NHPA) compliance.

The Service understands that standards for Phase I survey fieldwork and reporting issued by the State Historic Preservation Office (SHPO) in each of the 13 states covered by Region 5 differ from these standards to varying degrees. CRM consultants are assumed to be aware of the applicable SHPO standards. Where differences exist between the Service's and the SHPO standards, the stricter standard will apply. If a direct conflict in requirements appears to exist, the Regional Historic Preservation Officer (RHPO) should be informed prior to the archaeological survey, so that the conflict can be resolved before the fieldwork is performed.

REQUIREMENTS

CRM consultants (key personnel, including all individuals directing work in the field) should be able to provide documentation to confirm that they fulfill the Secretary of the Interior's Standards for practicing archaeology on federal lands.

STUDY COMPONENTS

Studies will be accomplished in phases involving background and literature review, fieldwork, analysis of data obtained through the fieldwork, and management recommendations (including impact evaluation in the case CRM studies).

1. Background and Literature Review. This element should expand upon and synthesize extant data. It should include general prehistoric and historic background

supplemented by locally specific archaeological data and paleoecological and geological reconstruction. Site records and reports of previous studies in the vicinity should be examined at the SHPO and elsewhere, to place recorded sites in context. In addition to published texts and maps, some recourse to unpublished records and collections, and interviews with knowledgeable individuals in the vicinity will probably be necessary. The resulting body of data will need to be synthesized, placed in the larger context of local, state, and regional prehistory and history, and explicitly tied to the report conclusions.

2. Fieldwork. Phase I fieldwork will typically be done with the intention of determining presence of archaeological resources. As discussed in the section on Recommendations (below), CRM consultants undertaking CRM surveys are advised to also obtain a preliminary determination of vertical and horizontal dimensions of any located archaeological sites, the contextual integrity of cultural deposits, and cultural affiliation of components. The report should contain a justification of the methodology used, and detailed description of the testing program.

a. Standard Testing Strategy. The strategy outlined below is expected for all CRM related fieldwork, unless a rationale for other approaches has been approved by the RHPO. As outlined at the end of this section, alternative strategies may be desirable and effective for other types of studies or CRM studies in specific environments.

A staggered, 8-meter interval shovel test grid is the standard for work performed by Service Archaeologists and contractors employed by the Service in this Region. Shovel test pits shall measure 50 x 50 cm square, and shall be excavated to a depth of at least 50 cm below the ground surface and to the depth of sediments that are over 12,000 years in age. Extensive professional literature and the Service Archaeologists' considerable personal experience have both consistently shown that larger intervals are unlikely to locate small sites expected in the environmental setting which characterize most of our Region's National Wildlife Refuges. Conversely, most sites found by our surveys would have been missed by testing intervals exceeding this interval, especially if intervals of 15-25 meters (**minimum** intervals in SHPO standards for some states) had been employed.

For similar reasons, use of small diameter excavation tools, such as post hole diggers, augers or corers, is not generally approved except as a supplement to shovel testing. The probability of intercepting archaeological material or features and correctly identifying them has been shown to decrease dramatically if such tools are employed exclusively. However, these tools are often appropriate to recover evidence such as geomorphology, palynology, or evidence of modern disturbance.

All identified features must have soil profiles drawn, sampled, and analyzed using Munsell readings and USDA soil typology. **All excavated soils must be screened through 1/4" (or finer) hardware mesh.**

If a study area is known to have been plowed in the past, it is appropriate to supplement this testing strategy by shallow disking and a close interval walkover survey. Unless otherwise agreed, such a walkover does not completely substitute for subsurface testing.

The RHPO and the Federal Land Manager shall be immediately contacted if human remains (or suspected human remains) or objects of a clearly ceremonial or funerary nature are encountered, and archaeological work will immediately cease in that area. The RHPO will initiate consultation with the SHPO and potentially affiliated communities, including Native American tribal governments.

b. Alternative Approaches. Different approaches (such as remote sensing technology or variations in intensity of sampling) will be considered if appropriate rationale is provided by the CRM consultants. Examples of studies which may require different approaches could include surveys undertaken for academic research, monitoring of long-term impacts (such as statewide environmental management programs), historic resource planning efforts, or emergency salvage of archaeological resources.

Examples of field situations which may require differing methods could include areas containing already located archaeological resources, areas known or expected to contain human remains, areas where substantial disturbance or modern soil accumulation can be documented, areas of deep alluvium, and wetland or marine environments.

3. Analysis and Curation In addition to the types and levels of artifact analysis generally required by SHPOs for Phase I surveys, radiocarbon, soil, floral, and faunal samples must be collected if found in uncontaminated contexts, and fully analyzed, including grain size for soil samples, standard or AMS dates for carbon, and genus/species level faunal and floral identification study. This requirement is intended to avoid a nationwide problem resulting from many early CRM surveys: curated samples remaining unanalyzed years after projects were completed and project funding terminated.

The CRM consultant will be responsible for safeguarding and maintaining all artifacts, and material samples not expended in analysis, together with all associated records, photographs, maps, and other data, to the conservation and curation standards of the Department of the Interior and the selected curation facility.

The CRM consultants will be responsible for labeling and packaging materials according to the curation facility standards, and effecting their transfer at the conclusion of the study. **Any fees for curation shall be incurred by the CRM consultant.** The RHPO shall be notified of the transmittal by a copy of the Artifact Transmittal Form with an attached Inventory, signed by both the contractor and repository representative.

The CRM consultant is responsible for ensuring curation of all records and materials recovered in the study at a repository approved by the U. S. Fish and Wildlife Service. The curation facility shall be identified in the final report. Curation facilities within the state in which the survey was done and supported by public funds are preferred. The RHPO will inform the CRM consultant if a curation agreement for Service collections already exists with a repository in the state, and will assist the CRM consultant in placing

their collection there, if possible. Artifact catalog sheets must be appended to the final report.

4. Recommendations and Impact Evaluation. The purpose of the assessment of individual sites identified during the inventory stage is to recommend management strategies for them over both the short and long term. Discussion of their susceptibility to looting, damage from natural causes, or potential for educational interpretation is considered appropriate here, in addition to any assessment of immediate or long-term impacts which may occur as a result of a CRM consultant's project.

In cases where a survey is done as part of compliance with NEPA and NHPA, the Service considers **impact avoidance** of archaeological resources within its lands as the **recommended treatment** of these resources. If avoidance cannot be assured, project proponents must thoroughly and explicitly describe why this is the case.

Therefore, any data obtained on site limits at this stage is an essential part of impact assessment, as is the discussion of potential eligibility for inclusion in the National Register of Historic Places. CRM consultants are especially encouraged to consider this in scoping their proposals, as greater development of such information in a Phase I may enable their project to avoid impact, and save the cost and time of further archaeological studies. RHPO coordination for further studies for National Register eligibility (Phase II) and impact mitigation (Phase III) must be sought if avoidance of resources cannot be assured.

REPORT

The Service requires two copies of a draft report and two of a final report on archival quality paper, detailing the work done, the survey results, and recommendations for further studies if necessary. The report shall include, (but is not limited to) the following elements: abstract, table of contents and list of figures, introduction, methodology, brief evaluation of previous work in the area, consideration of identified cultural resources in the area, analysis of data collected, recommendations, summary, and bibliography.

The abstract shall be a synopsis of the report, including an outline of the scope of study, field and laboratory methods, and results-both in terms of resources identified and in terms of recommendations for avoidance of resources or further archaeological study. The location of the study shall be noted in the abstract in terms of landform and drainage basin, as well as township, county, and state.

The introduction shall include, but is not limited to the following: the purpose of the survey, delineation of the study boundaries, and a general statement concerning the nature of the study conducted.

The background and literature review shall place the study area in its regional setting with regard to environmental factors affecting the location of cultural resources and the

known culture history, which should be **briefly** summarized and **explicitly** linked to the CRM consultant's study location. The report shall contain a brief evaluation of previous archaeological and historical studies of the region, including dates, extent, and adequacy of past work as it reflects on the interpretation of what might be found in the study area

The methodology used in data collection and analysis shall be described in sufficient detail for a reviewer to understand what was done and why. This shall include a discussion of surveying and sampling procedures, the types of data collected, artifact and feature retrieval procedures, recording techniques, classificatory scheme, method of chronological determination, and any special analytical techniques.

Maps, diagrams, and photographs that show the survey areas, locations of individual excavation units, and locations of all identified cultural resources, shall be included. All maps will include a north arrow and graphic scale in metric measurement. For historic period resources, an English measure scale must also be provided. At least one map must be a section of a U.S. G. S. quadrangle showing the study area in relation to recorded sites and the federal land boundary. **All** excavation unit profiles, clearly showing artifact and sampling locations shall also be included in the report. If many profiles are involved, they may be placed sequentially in an appendix, with typical and/or noteworthy ones illustrated in the main body of the report.

The inventory of all located cultural resources in the study area shall include an estimate of the aerial extent of the sites. The Service recognizes that the accuracy of this will reflect the level of field effort. As discussed in the preceding section, CRM consultants are encouraged to strive for greater accuracy in this estimate than may be typical of Phase I survey, so that the Service's policy of impact avoidance can be implemented where possible.

Recommendations for each site should discuss whether or not further work is needed to determine National Regional eligibility; current, past, and projected impacts to the site; and (for CRM studies) whether or not project redesign can avoid impact on the site. Reference should be made to SHPO Site Contexts during this discussion, but it should not be limited by them.

U.S. Fish and Wildlife Service Region 5 Site Forms and state site forms shall be completed for all sites, and an artifact catalog shall be included in the report. State site numbers and U.S. Fish & Wildlife Service site numbers shall be used throughout the report, for both recorded and newly discovered sites.

GUIDELINES FOR ADMINISTRATIVE PROCEDURES

1. All phases of the study shall be coordinated with updates through the COR to the Service's Cultural Resources reviewer for Hurricane Sandy projects (Timothy Binzen, Archaeologist, Regional Office in Hadley, Massachusetts, Tel. 413-253-8731).

Appendix B

2. CRM consultants assume all responsibility for liabilities incurred to themselves, equipment, or to sites being studied during this work. All excavations must be backfilled at completion of fieldwork, and reseeded may be required at the direction of the Federal Land Manager (Refuge manager or equivalent).

3. As noted earlier, the RHPO and the Federal Land Manager will be immediately contacted if human remains or objects of a clearly ceremonial or funerary nature are encountered, and work will immediately cease in that area. The RHPO will initiate consultation with the SHPO and potentially affiliated communities, including Native American tribal governments.

4. The Service will perform all consultations with federally recognized Tribes as required under NHPA (Sec. 106). CRM consultants are not responsible for Tribal consultations or correspondences related to their CRM studies.

APPENDIX D

LIST OF PLANT SPECIES OBSERVED AT THE SITE

Plant Species Observed at the HQ Impoundment Site
July 2015
Galloway Township, Atlantic County, New Jersey

Species	Common Name
<i>Acer rubrum</i>	Red Maple
<i>Acer saccharinum</i>	Silver Maple
<i>Achillea millefolium</i>	Common Yarrow
<i>Ageratina altissima</i>	White Snakeroot
<i>Allium vineale</i>	Crow Garlic
<i>Alnus serrulata</i>	Brookside Alder
<i>Amaranthus albus</i>	Tumbleweed
<i>Ambrosia artemisiifolia</i>	Annual Ragweed
<i>Andropogon glomeratus</i>	Bushy Bluestem
<i>Andropogon virginicus</i>	Broom-Sedge
<i>Artemisia vulgaris</i>	Common Wormwood
<i>Asclepias syriaca</i>	Common Milkweed
<i>Baccharis halimifolia</i>	Groundseltree
<i>Betula populifolia</i>	Gray Birch
<i>Bidens frondosa</i>	Devil's-Pitchfork
<i>Boehmeria cylindrica</i>	Small-Spike False Nettle
<i>Calystegia sepium</i>	<i>Hedge False Bindweed</i>
<i>Carex annectens</i>	Yellow-Fruit Sedge
<i>Carex bromoides</i>	Brome-Like Sedge
<i>Carex crinita</i>	Fringed Sedge
<i>Carex lupulina</i>	Hop Sedge
<i>Carex lurida</i>	Sallow Sedge
<i>Carex stipata</i>	Stalk-Grain Sedge
<i>Carex vulpinoidea</i>	Common Fox Sedge
<i>Celastrus orbiculatus</i>	Asian Bittersweet
<i>Centaurea maculosa</i>	Spotted Knapweed
<i>Chamaecrista nictitans</i>	Partridge-Pea
<i>Chenopodium album</i>	Lamb's-Quarters
<i>Chondrilla juncea</i>	Skeleton Weed
<i>Cirsium arvense</i>	Canadian Thistle
<i>Clethra alnifolia</i>	Coastal Sweet-Pepperbush
<i>Cornus amomum</i>	Silky Dogwood
<i>Cyperus esculentus</i>	Chufa
<i>Daucus carota</i>	Queen Anne's-Lace
<i>Desmodium paniculatum</i>	Panicled-Leaf Tick-Trefoil
<i>Dichanthelium clandestinum</i>	Deer-Tongue Rosette Grass
<i>Distichlis spicata</i>	Coastal Salt Grass
<i>Echinacea purpurea</i>	Purple Coneflower
<i>Echinochloa crus-galli</i>	Large Barnyard Grass
<i>Elaeagnus umbellata</i>	Autumn Olive
<i>Eleocharis obtusa</i>	Blunt Spike-Rush
<i>Equisetum arvense</i>	Field Horsetail

Plant Species Observed at the HQ Impoundment Site
July 2015
Galloway Township, Atlantic County, New Jersey

Species	Common Name
<i>Erigeron annuus</i>	Eastern Daisy Fleabane
<i>Euthamia graminifolia</i>	Flat-Top Goldentop
<i>Eutrochium purpureum</i>	Sweet-Scented Joe-Pye-Weed
<i>Hibiscus moscheutos</i>	Crimson-Eyed Rose-Mallow
<i>Ilex opaca</i>	American Holly
<i>Impatiens capensis</i>	Spotted Touch-Me-Not
<i>Iris pseudacorus</i>	Pale-Yellow Iris
<i>Iva frutescens</i>	Jesuit's-Bark
<i>Juglans nigra</i>	Black Walnut
<i>Juncus effusus</i>	Lamp Rush
<i>Juncus gerardii</i>	Saltmarsh Rush
<i>Juncus tenuis</i>	Lesser Poverty Rush
<i>Juniperus virginiana</i>	Eastern Red-Cedar
<i>Leersia virginica</i>	White Grass
<i>Lespedeza cuneata</i>	Chinese Bush-Clover
<i>Leucanthemum vulgare</i>	Ox-Eye Daisy
<i>Linaria vulgaris</i>	Butter and Eggs
<i>Lonicera japonica</i>	Japanese Honeysuckle
<i>Lonicera morrowii</i>	Morrow's Honeysuckle
<i>Lonicera tatarica</i>	Twinsisters
<i>Nuphar lutea</i>	Yellow Pond-Lily
<i>Nymphaea odorata</i>	American White Water-Lily
<i>Nyssa sylvatica</i>	Black Tupelo
<i>Oenothera biennis</i>	King's-Cureall
<i>Panicum amarum</i>	Bitter Panic Grass
<i>Panicum virgatum</i>	Wand Panic Grass
<i>Parthenocissus quinquefolia</i>	Virginia-Creeper
<i>Persicaria amphibia</i>	Water Smartweed
<i>Persicaria hydropiper</i>	Mild Water-Pepper
<i>Persicaria lapathifolia</i>	Dock-Leaf Smartweed
<i>Persicaria maculosa</i>	Lady's-Thumb
<i>Persicaria perfoliata</i>	Asiatic Tearthumb
<i>Persicaria sagittata</i>	Arrow-Leaf Tearthumb
<i>Persicaria virginiana</i>	Jumpseed
<i>Phragmites australis</i>	Common Reed
<i>Phytolacca americana</i>	American Pokeweed
<i>Pinus rigida</i>	Pitch Pine
<i>Pinus virginiana</i>	Virginia Pine
<i>Plantago lanceolata</i>	English Plantain
<i>Plantago major</i>	Great Plantain
<i>Potentilla recta</i>	Sulphur Cinquefoil
<i>Prunus serotina</i>	Black Cherry

Plant Species Observed at the HQ Impoundment Site
July 2015
Galloway Township, Atlantic County, New Jersey

Species	Common Name
<i>Quercus alba</i>	Northern White Oak
<i>Quercus falcata</i>	Southern Red Oak
<i>Quercus ilicifolia</i>	Scrub Oak
<i>Quercus rubra</i>	Northern Red Oak
<i>Rhus copallinum</i>	Winged Sumac
<i>Robinia pseudoacacia</i>	Black Locust
<i>Rubus allegheniensis</i>	Allegheny Blackberry
<i>Rumex acetosella</i>	Common Sheep Sorrel
<i>Rumex crispus</i>	Curly Dock
<i>Salicornia bigelovii</i>	Dwarf Saltwort
<i>Sassafras albidum</i>	Sassafras
<i>Schoenoplectus pungens</i>	Three-Square
<i>Scirpus cyperinus</i>	Cottongrass Bulrush
<i>Securigera varia</i>	Crown Vetch
<i>Setaria viridis</i>	Green Foxtail
<i>Smilax rotundifolia</i>	Horsebrier
<i>Solidago altissima</i>	Tall Goldenrod
<i>Solidago canadensis</i>	Canadian Goldenrod
<i>Solidago rugosa</i>	Wrinkle-Leaf Goldenrod
<i>Solidago sempervirens</i>	Seaside Goldenrod
<i>Spartina alterniflora</i>	Saltwater Cord Grass
<i>Spartina patens</i>	Salt-Meadow Cord Grass
<i>Staphylea trifolia</i>	American Bladdernut
<i>Toxicodendron radicans</i>	Eastern Poison-Ivy
<i>Trifolium arvense</i>	Rabbit's Foot Clover
<i>Typha latifolia</i>	Broad-Leaf Cat-Tail
<i>Vaccinium corymbosum</i>	Highbush Blueberry
<i>Verbascum thapsus</i>	Great Mullein
<i>Vernonia noveboracensis</i>	New York Ironweed
<i>Viburnum dentatum</i>	Southern Arrow-Wood

APPENDIX E
EFH ASSESSMENT

Edwin B. Forsythe
National Wildlife Refuge –
Headquarters
Impoundment
Design/Build Project

Essential Fish Habitat Assessment

U. S. Fish and Wildlife Service

2/4/2016

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LIST OF ACRONYMS

BMP	Best Management Practice
EFH	Essential Fish Habitat
FMP	Fisheries Management Plan
HQ	Headquarters
NJDEP	New Jersey Department of Environmental Protection
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
WCS	Water Control Structures

1.0 INTRODUCTION

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), set forth procedures to identify, conserve, and enhance Essential Fish Habitat (EFH) for fish and shellfish species regulated under a Federal fisheries management plan (FMP) (NOAA 2004). Essential Fish Habitat is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” (NOAA 2015a). The Magnuson-Stevens Act requires Federal agencies to consult with the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (NOAA 2004). This EFH consultation process requires the Federal agency to prepare a written EFH Assessment that describes the effects of the action on EFH, and to minimize any adverse effects to the extent practicable (NOAA 2015a, 2004). The NMFS then provides recommendations to the agencies to avoid, minimize, mitigate, or offset the adverse effects (NOAA 2015a).

This EFH Assessment was prepared for the HQ Impoundment Design/Build Project at the headquarters (HQ) within the U.S. Fish and Wildlife Service (the Service) Edwin B. Forsythe National Wildlife Refuge (the Refuge) (Project).

2.0 SITE AND PROJECT DESCRIPTION

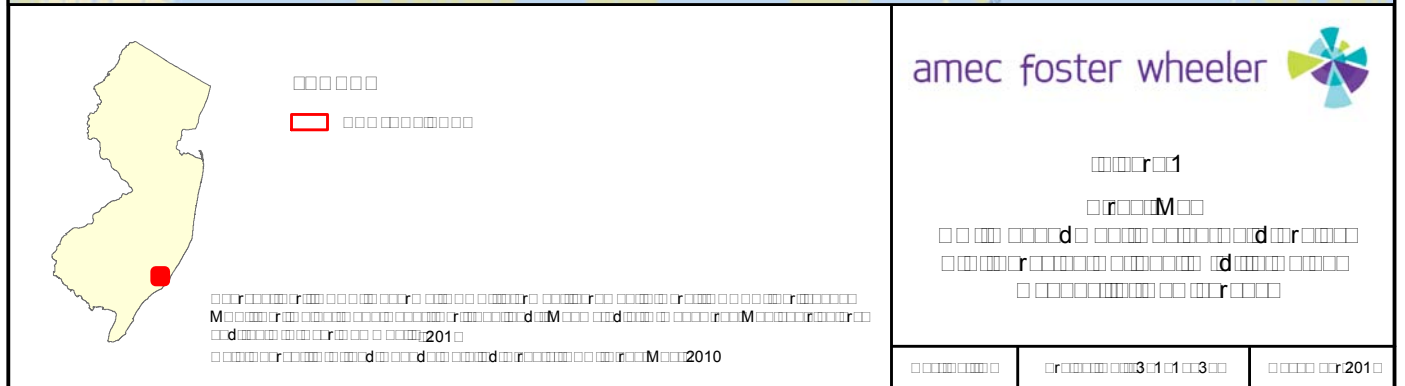
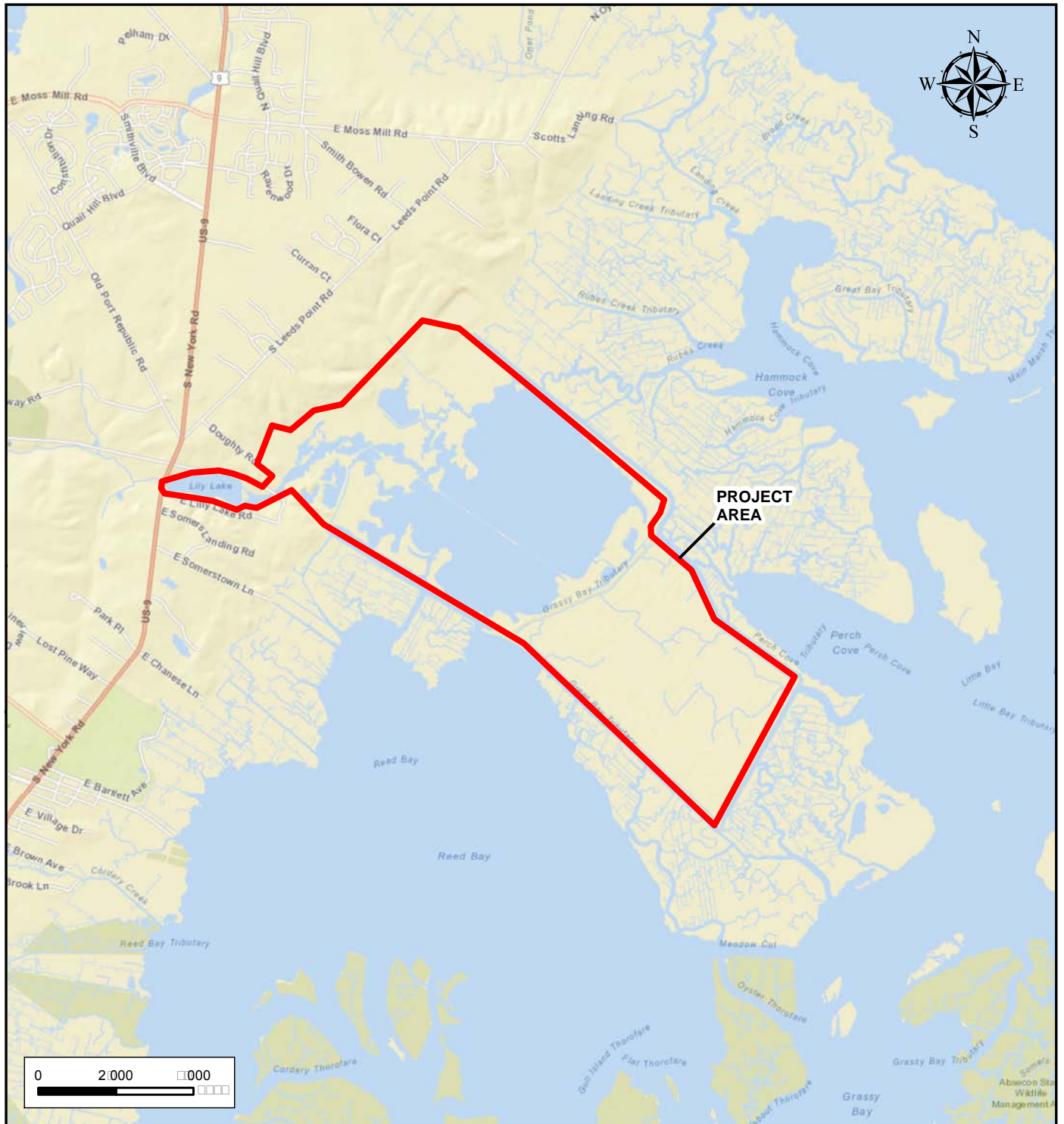
The Project is located in the unincorporated community of Oceanville, Galloway Township, Atlantic County, New Jersey (**Figure 1**) and is identified by Galloway Township as a portion of Block 1301, Lot 1. The parcel is located in the Coastal Plain physiographic section of the State.

The Project area consists of a number of impoundments known as the HQ Impoundment System (the System). The System was constructed in the early 1950s to allow the Service to manage the habitat needs of migratory birds. The System includes the East Pool, West Pools, Experimental Pool, Gull Pond, Doughty Creek, and Lily Lake. Various dikes and water control structures (WCS) are used to actively manage the inflow and outflow of water in the System, though currently one of the dikes has been breached and some of the WCSs are inoperative. An approximately 8-mile perimeter dike surrounds the East and West Pools which is used as a wildlife viewing drive (Wildlife Drive). Dikes separate the East and West Pools (Cross Dike), and bisect the West Pool in an east-west direction (Long Dike), as well as separate the West Pool into a northern (~ 500 acres) and southern section (~300 acres) (**Figure 2**).

The East Pool, also known as the Danzenbaker Pool, is maintained as a saltwater impoundment through WCS #3, #4, and #5. The West Pool, including the northern portion, also known as Vogt Pool North, and the southern portion, also known as Vogt Pool South, are maintained as freshwater impoundments. These pools will hereafter be referred to in this EFH Assessment as the Northwest and Southwest Pools. Freshwater inputs to the Northwest and Southwest Pools include Doughty Creek, Lily Lake, and freshwater springs (USFWS 2013) (**Figure 3**). Water flow into the Northwest and Southwest Pools is managed through WCS #12 (Northwest Pool) and through WCS #11 (Southwest Pool). Outflow is provided through WCS #9 (Northwest Pool) and #10 (Southwest Pool).

The Project includes the repair of Long Dike (breached by Hurricane Sandy), the replacement of inoperative WCS #3, the placement of new erosion control material at Turtle Cove and Dog Leg to address concerns with resiliency of the dike system to sea level rise brought about by climate change, and the repaving of Wildlife Drive. Additionally, this EA considers the possibility of replacing the inoperative WCS #7. Resiliency concerns are further addressed through adaptive water management practices recommended as part of the overall Project.

Prior to being breached, Long Dike provided for independent management of water levels in the Northwest and Southwest Pools. This gave the refuge the ability to treat exotics, encourage growth of high value food sources, and provide suitable habitat for migratory birds with greater precision. Over time these WCSs and dikes have been compromised, particularly as a result of damage brought about by Hurricane Sandy. The WCSs and dikes are either not functioning as intended or are expected to be compromised further. For example, WCS #3, located at the northeastern corner of the East Pool, is the primary inlet and outlet for water exchange between the pool and the surrounding tidal waters. Although presently operational, this structure is not water-tight and thus allows hydraulic exchange that is far greater than desired by the Service. Also, a significant length of the Long Dike, which separates the West Pool into a north and south portion, has been breached, resulting in the West Pools becoming a single large pool. Other areas of concern include eroded areas of Wildlife Drive; most notably, the outboard slopes near Turtle Cove in the southern portion





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of the drive and the outboard slopes near the Dogleg section in the northern portion of the drive. These areas are considered susceptible to overtopping in the future from tidal surge events with 10-year waves if not repaired (SDE 2015). **Appendix A** presents photographs of the various Project areas.

The entire System was originally designed to maintain freshwater or brackish wetlands and associated flora and fauna. The East Pool was designed to receive freshwater from the western pools through WCS's #6 & #8 and tidal flow in from the adjacent estuary through four open tide gates (WCS #1, #3, #4 and #5). However, the discharge pipe for WCS #8 was damaged in Hurricane Sandy and is currently buried and non-functional. WCS #6 is also currently non-functional (silted-in). Therefore, the influx of freshwater to East Pool from the western pools has been cut off. In addition, the water balance study conducted within the System indicated that there is not enough freshwater supplied to the System, via Doughty Creek and Lily Lake, to be able to support the East Pool as a freshwater impoundment system as originally intended. Subsequently, the Service has decided not to attempt to convert East Pool back into a freshwater community, but will continue to manage it as a salt marsh habitat for waterfowl, shorebirds and piscivorous migratory birds (USFWS 2004).

The breaching of dikes and infiltration of surrounding saltwater has reduced the ability of the pools to function as separate wetland habitats. The System, in its current condition, cannot be used to effectively maintain freshwater impoundments within a tidal estuary. The loss of such a vital habitat can have detrimental impacts on migrating bird populations that rely on such a community for foraging, reproduction, and survival. Therefore, the Service's mission of conservation and protection of wildlife resources and the conservation of wetlands is in jeopardy at this site. The Proposed Action will restore water flow control and containment function within the System, thereby re-establishing fully functional wetland habitat communities within the pools.

3.0 PROPOSED ACTION

Two alternatives, one with optional supplemental activity, were considered during the development of the EA. Alternative 1 is the Proposed Action, and includes repairing and regrading/stabilizing eroded portions of the dikes within the System, replacing WCS #3, and resurfacing Wildlife Drive. Alternative 1 is considered to be the preferred alternative as it is the most direct and effective approach for achieving the Project objectives of adequately managing the System to achieve the Service's wildlife management goals, as well as being able to respond to climate change. Subsets of this alternative, Alternatives 1a and 1b, include supplemental actions that are contingent upon funding. The Alternatives Considered but Eliminated section details potential actions that were considered as part of data gathering efforts, but were removed from consideration due to disqualifying factors such as cost-effectiveness and producing adverse impacts with limited benefit. These and the No Action Alternative are described below.

The implementation of Alternatives 1a and 1b would serve to further the Project objective of the Service, which is to implement a new water management plan that more effectively controls the eastern and western pools as separate saltwater and freshwater wetlands, respectively. Water flow and containment function will also be increased to more effectively establish three separate, fully-functional wetland habitat communities within the three larger impoundments under these alternative supplements.

3.1 Alternative 1 – Proposed Action

Freshwater coastal impoundments require significant maintenance to remain functional. However, when properly managed and maintained, coastal impoundments have a high carrying capacity for waterbirds and contribute to increased biodiversity. Accelerated sea level rise and large storm events, such as hurricanes and nor'easters, are expected to increase the risk of breaching of dike structures used to maintain coastal impoundments, thereby necessitating re-evaluation and adaptation of management techniques (USFWS 2004).

A number of individual restoration/construction/management activities are planned as part of the Proposed Action. The first action includes the repairing and filling of the Long Dike breach (the dike separating the two western impoundments), allowing for the more effective management of the western impoundments. The breach of Long Dike has eliminated the ability of the Service to manage the western impoundments as two distinct wetland systems. The breach is actually two separate eroded areas that, when combined, extend 580 feet along the east/central alignment of the dike. Approximately 3,220 additional feet of the dike is eroded and in disrepair, requiring regrading and filling. The repairs to the dike will allow the Service to once again manage the western impoundments as two separate pools.

A second action includes the replacement/addition of riprap armoring at two distinct locations along the North and South Dikes to stabilize downstream embankment slopes. The current conditions are such that riprap that was historically placed within the Turtle Cove section of South Dike is no longer effective and the Dogleg portion of North Dike is vulnerable as its slopes have never been stabilized using riprap or other engineering controls. Therefore, these areas are subject

to increased erosional pressures that would result from severe storms, sea level rise, or other climatic actions that would occur as a result of climate change.

An assessment of the eroded sections of Turtle Cove and the Dogleg revealed that these two areas are feasible for a living shoreline in contrast to solely hard engineering. Where feasible, living shorelines are an effective alternative to traditional shoreline hardening. This technique provides shoreline protection with benefits to wildlife and water quality through the use of vegetation and a medium for sediment/soil microbial activity. With long-term protection of these shorelines as a goal, the following summarizes the general steps in establishing the living shoreline:

- Excavate an anchor trench at the toe of slope.
- Regrade the shoreline to a 5H:1V slope.
- Place a geotextile underlayment.
- Place 18 inches of R5 stone (9 to 18 inch sized) on geotextile.
- Place sandy soil to fill voids to provide planting medium.
- Revegetate with a combination of seed mix, herbaceous plugs, and potted plants.

A third activity includes the replacement of WCS #3. WCS #3 is not functioning appropriately, which precludes the control of water into or out of the eastern impoundment. This failure compromises the ability of the Service to manage the pool in accordance with the management objectives of the refuge. The scour and erosion around this WCS is so significant, it contributed to the increased Priority Ranking Factor value and overall safety classification of “Conditionally Poor” for the Wildlife Drive dike inspection report (SDE 2015).

Because previous attempts to repair erosion and scour at WCS#3 by adding fill and riprap was met with limited or no success, replacement of the structure is required. A new WCS #3 is also necessary to reduce velocities into and out of the East Pool as recommended by SDE 2015. The design of the replacement WCS will be in line with the Service’s decision to maintain the East Pool as a salt marsh community.

A final activity within the Proposed Action includes the re-surfacing of the Wildlife Drive road way. This will be accomplished with the application of 2-1/2 inches of crushed concrete roadway aggregate.

A more detailed list of components required for each task is presented in **Appendix B**. The Statement of Work is presented in **Appendix C**. A summary of the restoration components to be performed is listed below:

- Repair the breached and eroded portions of the Long Dike.
- Armor/stabilize the Dogleg section of the North Dike.
- Armor/stabilize the Turtle Cove Section of the South Dike.
- Replace the East Dike WCS #3.
- Re-surface (cap) approximately 6 miles of Wildlife Drive.

The completion of this Project would satisfy the objective of the Service, which is to implement a new water management plan for the wetland System to maintain the eastern and western pools as separate saltwater and freshwater wetlands, respectively. There will be no change in size or conversion of existing water bodies/wetlands to that of a different salinity regime under the proposed alternative. Freshwater systems will remain fresh, and saltwater will remain saline (**Table 1**). Under the preferred alternative, water flow and containment function will be adjusted to effectively establish three separate, fully-functional wetland habitat communities within the three larger impoundments. This will help give the Service the ability to better manage the impoundments as wintering grounds and migratory stopover sites or as breeding grounds for bird species reliant on such habitats (Amec 2015).

Table 1			
Project Area Waterbodies Pre- and Post-Construction			
Waterbody	Acreage	Pre-Construction Habitat Type	Post-Construction Habitat Type
Lily Lake	22	Freshwater	Freshwater
Doughty Creek	54	Freshwater	Freshwater
Experimental Pool	21	Freshwater	Freshwater
Northwest Pool	526	Freshwater	Freshwater
Southwest Pool	296	Freshwater	Freshwater
East Pool	536	Saltwater	Saltwater

The resurfacing of Wildlife Drive will “cap” the dike, creating a more wear-resistant surface to increase resiliency of the exterior roadway. Access to the refuge areas for the Service as well as for the hundreds of thousands of visitors that come to the refuge each year will also be improved.

Various supplemental activities have been identified by Amec that would potentially allow for greater management of the water within the System, and would allow for a higher degree of adaptive management by the Service in reaching their wildlife management objectives. These supplemental activities would potentially be incorporated into the Proposed Action should funding be made available by the Service. The individual potential alternatives are described as follows:

3.2 Alternative 1a – Proposed Action and Replacement of WCS #7

Alternative 1a includes the Proposed Action and replacement of WCS #7 along the Long Dike. Water Control Structure #7 is not functioning properly, and coupled with the current breach in the Long Dike, collectively adds to the lack of water control between the two western impoundments. Replacement of WCS #7 within the footprint of the Long Dike Breach Repair would allow the Service the flexibility to manage water levels between the Northwest and Southwest Pools, and would greatly aid in the ability of the Service to address habitat management concerns within the pools. Placing the replacement WCS #7a within the footprint of construction greatly simplifies the process of installing this structure.

3.3 Alternative 1b – Proposed Action and Stop Log Installation

Alternative 1b includes the Proposed Action and the replacement of the existing 6-8 inch stop logs with low height (less than 4 inches) stop logs at each of the WCSs in the System. This feature would allow for fine-tune management and control of hydraulic exchange than what is offered by the WCSs alone.

3.4 Alternative 2 – No Action

Another alternative explored for this Project was the No Action Alternative, which would allow for no repairs to the eroded dikes, leaving damaged WCS #3 in place, and no resurfacing of Wildlife Drive. This No Action Alternative is not preferred because surrounding wave action and future rises in sea level could reduce the ability of the dikes to withstand increased pressures of wind and waves. In addition, the civil/hydraulic configuration of WCS #3 on East Dike is of concern as scour was confirmed on both the inlet and outlet side of the WCS (SDE 2015). If not fixed, the flow of water between the East Pool and the surrounding estuary will remain uncontrollable and could lead to increased instability within the System and may jeopardize the roadway.

Without repairing the dikes and replacing WCS #3, the ability to control water flow into and out of the three impoundments will not be reestablished and critical wetland habitat used by thousands of migrating birds annually will be lost. Controlled drawdowns, used to provide foraging habitat for shorebirds by creating mudflats and shallow water areas, while at the same time concentrating food for wading birds, will not be possible. The storage of water in an impoundment over the growing season, or several growing seasons, to provide breeding habitat for waterfowl and marsh birds, will also not be possible. This will be detrimental to avian species that use the HQ impoundments, as the preference of bird species to utilize certain habitat types is not always consistent and predictable. Therefore, management of water levels for a particular species is an ongoing process requiring ongoing adaptive management strategies.

If the structures are not repaired/replaced, the ability to control invasive species and promote desirable plants will also be lost. Plants such as the invasive non-native common reed requires diffusion of gasses through rhizomes which cannot occur when the plant becomes over inundated with water. Flooding an impoundment through all or part of a growing season, stymies growth of such undesirable vegetation. Drawdown following flooding allows for germination of moist-soil plants preferred by waterfowl (USFWS 2013).

Further erosion of the dikes and the area around WCS #3 can also lead to an increase in turbidity in the area, causing damage to surrounding benthic and fish communities.

3.5 Alternatives Considered but Eliminated

3.5.1 Dredging and Grading of the Impoundments

Dredging and grading of the impoundment bottom would manipulate the bathymetry such that the refuge would have greater control over water levels within the pools as well as the amount and

type of habitat available to migratory birds. This alternative was eliminated from further consideration as it would be logistically difficult and cost prohibitive with no guarantee of long-term habitat benefit. Dredging of Lily Lake would provide no benefit in water storage as the elevation of Lily Lake's lakebed is too similar to the impoundments to allow the movement of additional water. Lowering the impoundment bottom within West Pool could also increase the risk of salt water seepage from surrounding waters and make the System less resilient to sea level rise.

3.5.2 Increase Stream Flow to Enhance Water Supply

A water balance study done in 2015 determined the System's water availability is limited by rainfall and the storage capacity of Lily Lake. To increase water availability, a well could be established to feed freshwater into the System. This alternative was eliminated from further consideration as it would require comprehensive modeling and could potentially affect groundwater availability for the watershed, possibly increasing the rate of salt water inundation to the aquifer.

3.5.3 Subdivide the West Pools

Building additional dikes within the West Pools, effectively creating a series of smaller pools, would allow greater flexibility of management of the Pools. This alternative was eliminated from further consideration as it would be cost prohibitive, require several new WCSs, and impact much more freshwater habitat compared to the preferred alternative.

4.0 PROJECT AREA EFH

Able (1992) reports that the marine ichthyofauna of New Jersey consists of 336 fish species represented by 116 families which occur from the upper limits of saltwater intrusion in the estuaries (including Delaware Bay) to the 200-meter (656.2-foot) contour at the edge of the continental shelf. GMI (2009) notes that various inshore (estuaries, bays, saltmarshes, tidal creeks, and coastal beaches), and offshore environments (sand ridges, continental shelf, canyons, hard bottom), as well as artificial reefs (ship wrecks and man-made structures) along the New Jersey coast line are important to fish and fisheries. Sherman *et al.* (1996) report that a high proportion of fish species within the coastal New Jersey environment are seasonal, while few (less than 5 percent) are year round residents.

Refuge lands are bordered by, and are hydrologically connected to, estuarine habitats composed of saltmarshes, streams, ponds, bays, and rivers (USFWS 2013). In general, the Refuge is home to a rich variety of fish, shellfish, and crabs. These species are of significant importance to the sport and commercial fisheries, as well as an important food base for many birds and mammals (USFWS 2004; USFWS 2013).

In the *Significant Habitats and Habitat Complexes of the New York Bight Watershed* report (USFWS 1997), the NJDEP reported their collection of 59 species of fish during a one-year study of the Brigantine Bay and Marsh Complex (Complex #4) which comprises the Project area. Atlantic silverside (*Menidia menidia*) composed the majority of the catch (52 percent) followed by bay anchovy (*Anchoa mitchii*), composing 36 percent. Other abundant species included spot (*Leiostomas xanthurus*), mummichog, striped killifish (*Fundulus majalis*), American sandlance (*Ammodytes americanus*), bluefish (*Pomatomus saltatrix*), white mullet (*Mugil curema*), weakfish (*Cynoscion regalis*), winter flounder (*Pleuronectes americanus*), smooth dogfish (*Mustelus canis*), windowpane (*Scophthalmus aquosus*), Atlantic menhaden (*Brevoortia tyrannus*), sheepshead minnow (*Cyprinodon variegatus*), striped mullet (*Mugil cephalus*), and northern pipefish (*Syngnathus fuscus*). Some species of shellfish were found to be sporadically abundant, such as northern quahog (*Mercenaria mercenaria*), softshell clam (*Mya arenaria*), blue mussel (*Mytilus edulis*), and Eastern oysters (*Crassostrea virginica*).

The NMFS EFH mapper (NOAA 2015b) was consulted to determine which fish species habitat is mapped on and immediately adjacent to the Project site to assess their potential of being affected by the Proposed Action. The results are listed in **Table 2** on the following page.

In addition to the information contained in **Table 2**, Habitat Areas of Particular Concern are also documented for the sandbar shark at the Project site and in Reed Bay, south of the site (NOAA 2015b).

The NOAA Guide to Essential Fish Habitat Designations in the Northeastern United States was also consulted to identify additional EFH mapped near the project area not listed by the EFH mapper. The associated 10' x 10' Square Coordinates list for the project area covers a significantly larger area than the focused assessment associated with the findings using the EFH Mapper. Therefore, the likelihood of the following species being present in the project area, as represented

Table 2 EFH On and Immediately Adjacent to the Project Area based on the EFH Mapper						
Common Name	Scientific Name	Life Stage	Outside of Impoundments (e.g, Turtle Cove Beach and Dog-Leg)	Inside of Impoundments	Ground or Pelagic	Habit
Clearence skate	<i>Raja eglanteria</i>	Adult	X		Ground	Seasonal
Sandbar shark ¹	<i>Carcharhinus plumbeus</i>	Neonate Juvenile Adult	X X X	X X X	Ground Pelagic Migratory	Seasonal
Sand tiger shark ¹	<i>Carcharias taurus</i>	Neonate Juvenile	X X		Ground/Pelagic Ground/Pelagic	Migratory
Winter skate	<i>Leucoraja ocellata</i>	Adult	X		Ground	Year-round
Little skate	<i>Leucoraja erinacea</i>	Adult	X		Ground	Migratory
Windowpane flounder ²	<i>Scopthalmus aquosus</i>	Juvenile Adult	X X		Ground Ground	Year-round
Monkfish	<i>Lophius americanus</i>	Adult Eggs Larvae	X X X		Ground Ground Ground	Unknown
Red hake	<i>Urophycis chuss</i>	Adult Larvae Juvenile Eggs	X X X X		Pelagic Pelagic Pelagic Pelagic	Migratory
Albacore tuna ¹	<i>Thunnus alalunga</i>	Juvenile	X		Pelagic	Migratory
Bluefin tuna ¹	<i>Thunnus thynnus</i>	Juvenile	X		Pelagic	Migratory

¹ The EFH mapper qualifies this occurrence by stating, “The inland extents of this data layer were defined by medium resolution coastline data and may be subject to coastline artifacts. Interpretation of the seaward extents of EFH for this species could vary depending on the resolution of the data used to portray the depth ranges. This data layer uses medium to low resolution isobaths, which were considered appropriate to the level of uncertainty inherent in the data.”

² Reported by the NJDEP in USFWS (1997) as abundant in the area.

Table 2 EFH On and Immediately Adjacent to the Project Area based on the EFH Mapper						
Common Name	Scientific Name	Life Stage	Outside of Impoundments (e.g, Turtle Cove Beach and Dog-Leg)	Inside of Impoundments	Ground or Pelagic	Habit
Dusky shark ¹	<i>Carcharhinus obscurus</i>	Neonate	X		Pelagic	Migratory
Scalloped hammerhead shark ¹	<i>Sphyrna lewini</i>	Juvenile	X		Pelagic	Unknown
Tiger shark ¹	<i>Galeocerdo cuvier</i>	Juvenile	X		Pelagic	Nomadic
Dusky Rockfish ³	<i>Sebastes ciliates</i>	ALL	X		Pelagic	Unknown
Smooth dogfish ^{1,2}	<i>Mustelus canis</i>	ALL	X		Pelagic	Migratory
Summer flounder	<i>Paralichthys dentatus</i>	Adult Juvenile Larvae	X X X		Ground Ground Ground	Migratory
Black sea bass	<i>Centropristis striata</i>	Juvenile Adult	X X		Ground Ground	Migratory
Scup	<i>Stenotomus chrysops</i>	Juvenile	X		Pelagic	Migratory
Longfin inshore squid	<i>Doryteuthis pealeii</i>	Juvenile Adult	X X		Pelagic Pelagic	Migratory Migratory
Bluefish ²	<i>Pomatomus saltatrix</i>	Adult Juvenile	X X		Pelagic Pelagic	Migratory Migratory
Atlantic butterfish	<i>Peprilus triacanthus</i>	Adult Juvenile	X X		Ground Ground	Unknown
Atlantic cod	<i>Gadus morhua</i>	Adult	X		Benthopelagic	Migratory

³ The EFH mapper qualifies this occurrence by stating, “This GIS data layer is a generalized interpretation of the textual definition of EFH, it does not fully represent the complexity of the habitats described in the designation. The textual description of EFH is always determinative of the presence or absence of EFH for this species.”

by the 10' x 10' Square Coordinates list, may be less than those indicated by the EFH mapper. The results are listed in **Table 3**.

Table 3 Additional EFH Listed Near the Project Area based on 10' x 10' Square Coordinates				
Common Name	Scientific Name	Life Stage	Ground or Pelagic	Habit
Winter flounder	<i>Pseudopleuronectes americanus</i>	Eggs Larvae Juvenile Adult	Ground Benthopelagic Ground Ground	Year-round
Windowpane flounder	<i>Scopthalmus aquosus</i>	Eggs Larvae	Pelagic Pelagic	Year-round
Atlantic sea herring	<i>Clupea harengus</i>	Juvenile Adult	Pelagic Pelagic	Year-round
King mackerel	<i>Scomberomorus cavalla</i>	Eggs Larvae Juvenile Adult	Pelagic Pelagic Pelagic Pelagic	Migratory
Spanish mackerel	<i>Scomberomorus maculatus</i>	Eggs Larvae Juvenile Adult	Pelagic Pelagic Pelagic Pelagic	Migratory
Cobia	<i>Rachycentron canadum</i>	Eggs Larvae Juvenile Adult	Pelagic Pelagic Pelagic Pelagic	Migratory
Tiger shark	<i>Galeocerdo cuvier</i>	Larvae	Pelagic	Nomadic

5.0 PROJECT EFFECTS ON EFH

The Proposed Action will result in direct impacts to sediment from the repair of the dike, the installation of armoring along Turtle Cove Beach and the Dogleg, the removal of WCS #3, and the installation of the new WCS #3. These impacts are small in scale, with some disturbances only temporary in nature, and would disturb the minimum amount of area below the mean high water line necessary to implement the Proposed Action (**Table 4**). The areas to be disturbed do not serve as spawning areas for the EFH species, and sufficient foraging area exists throughout the remainder of the system to compensate for the temporary disturbance. In addition, there are no mapped submerged aquatic vegetation areas in or near the Project area that would be impacted by Project activities.

Table 4				
Approximate Area Impacted Above and Below Mean High Water				
Project Activity	Approximate Upland Disturbance (Above the Mean High Water Line) (Square Feet)	Approximate In-Water Disturbance (Below the Mean High Water Line) (Square Feet)		Approximate Total Disturbance (Square Feet)
		Permanent	Temporary	
Restoration/repair of Long Dike	234,320*	0	0	234,320
Stabilization of Dogleg	29,016	16,224*	0	45,240
Stabilization of Turtle Cove	101,442	57,558*	0	159,000
Replacement of WCS #3	18,000	1,500	4,500	24,000
Re-surfacing Wildlife Drive	570,240	0	0	570,240

*Notes: The repairs to Long Dike are all contained within the impoundment system and are not subject to mean high water levels. Also note that although a total of approximately 73,782 square feet of permanent disturbance is proposed below the mean high water line for Dogleg and Turtle Cove, the permanently disturbed surface (i.e. riprap) lying between mean low water and mean high water will be mitigated through living shoreline techniques in the form of “joint” planting (i.e. vegetation in between riprap) of smooth cordgrass (*Spartina alterniflora*) plugs.

The Proposed Action will also result in indirect impacts to the water column from sediment suspension. There will be unavoidable, but temporary and localized increase in surface water turbidity from the sediment disturbance. This may cause minor disruption of fish and/or shellfish habitat. However, this is not considered to be a significant adverse effect because of the small scale of the disturbance, and its temporary and localized nature. These systems and associated species

are also subject to twice-daily tidal changes and are adapted to sediment suspension and periodic turbidity.

The proposed activities that are above the water line (*i.e.*, upland disturbances) (**Table 4**) are not expected to result in adverse impacts on EFH as the implementation of soil erosion and sedimentation controls, coupled with Best Management Practices (BMPs) will minimize the probability of soil runoff.

With the exception of the sandbar shark, the EFH species are mapped outside of the impoundments where the intent of the proposed activities are to decrease erosion, increase habitat area, and increase habitat quality. Any temporary, localized disturbances would be effectively outweighed by the Proposed Action's ecological uplift. The majority of the fish species are also not year-round residents and only use the project area on a seasonal basis or pass through the project area on their migrations. Adults and juveniles are expected to avoid the project area once construction begins.

6.0 MITIGATION STATEMENT AND CONCLUSION

No mitigation is proposed for EFH in this project. The intent of the Proposed Action is the enhancement of the ecological system associated with the HQ Impoundment System. The Proposed Action includes repairs to, or replacement of, existing structures that manage the habitat for wildlife resources at the Refuge. The anticipated direct and indirect disturbances are temporary and localized, and have been designed to impact the minimum amount of area.

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APPENDIX A

PHOTOGRAPHS



Photo 1

Entrance to the Wildlife Drive portion of the Refuge.



Photo 2

***Spartina patens* (salt hay) marsh around Leeds Eco Trail boardwalk, south of the HQ Impoundment System.**

PHOTOGRAPHIC LOG

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Headquarters Impoundment Design/Build
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Galloway Twp, Atlantic Co, New Jersey

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285 Davidson Avenue, Suite 405
Somerset, NJ 08873
E-22





Photo 3

View of the *Spartina patens* marsh from the Leeds Eco Trail boardwalk, exhibiting a man-made ditch, high marsh ridge, and a tidal creek.



Photo 4

General view of *Spartina patens* marsh, south of the HQ Impoundment System.

PHOTOGRAPHIC LOG

Edwin B. Forsythe National Wildlife Refuge
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E-23





Photo 5

Oldfield community located off the southwest corner of the HQ Impoundment System.



Photo 6

General view of the bay-side salt marsh community, located on the other side of Wildlife Drive from the Southwest Pool.

PHOTOGRAPHIC LOG

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Photo 7

General view of the bay-side salt marsh community and Wildlife Drive, south of Turtle Cove, facing southeast.



Photo 8

General view of the bay-side salt marsh community by Water Control Structure #10 (WCS #10), facing southeast.

PHOTOGRAPHIC LOG

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E-25





Photo 9

General view of the bay-side salt marsh community, south of Turtle Cove, facing southeast.



Photo 10

Sand bar on the bay side of Wildlife Drive, south of Turtle Cove and the South Observation Tower - exposed at low tide and used as a resting spot by birds.

PHOTOGRAPHIC LOG

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Photo 11

Turtle Cove, facing west.



Photo 12

Turtle Cove, facing east.

PHOTOGRAPHIC LOG

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E-27





Photo 13

Bay side salt marsh, at the southeast corner of Wildlife Drive.



Photo 14

Bay side salt marsh along eastern edge of HQ Impoundment System.

PHOTOGRAPHIC LOG

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E-28





Photo 15

Zoomed-out view of WCS #3 on the bay side, facing southwest.



Photo 16

Exposed mud flat at low tide on the bay side, by WCS #3.

PHOTOGRAPHIC LOG

Edwin B. Forsythe National Wildlife Refuge
Headquarters Impoundment Design/Build
Project
Galloway Twp, Atlantic Co, New Jersey

Amec Foster Wheeler Environment &
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Somerset, NJ 08873
E-29





Photo 17

WCS #3, bay side.



Photo 18

WCS #3, pool side.

PHOTOGRAPHIC LOG

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E-30





Photo 19

Bay side salt marsh, at the northeast corner of Wildlife Drive.



Photo 20

Eastern end of dog-leg area, facing southeast.

PHOTOGRAPHIC LOG

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E-31





Photo 21

Northern end of dog-leg area, facing north.



Photo 22

Zoomed-out photo of dog-leg shoreline, facing southeast.

PHOTOGRAPHIC LOG

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E-32





Photo 23

Zoomed-in photo of dog-leg shoreline, facing southeast.



Photo 24

Bay side salt marsh, opposite of the Northwest pool, showing Snow Goose eat out areas.

PHOTOGRAPHIC LOG

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E-33





Photo 25

General view of the East Pool (southwestern portion).



Photo 26

General view of the East Pool (south-central portion).

PHOTOGRAPHIC LOG

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E-34





Photo 27

General view of the East Pool (northeastern portion).



Photo 28

General view of the East Pool (southwestern portion).

PHOTOGRAPHIC LOG

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E-35





Photo 29

General view of the East Pool (central portion).



Photo 30

General view of the East Pool (northwestern portion).

PHOTOGRAPHIC LOG

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E-36





Photo 31

General view of the Northwest Pool (northeastern portion).



Photo 32

General view of the Northwest Pool (north-central portion).

PHOTOGRAPHIC LOG

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Project
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E-37





Photo 33

General view of the Northwest Pool (northwestern portion).



Photo 34

General view of the Northwest Pool (southeastern portion).

PHOTOGRAPHIC LOG

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E-38





Photo 35

General view of the Northwest Pool (east-central portion).



Photo 36

General view of the Northwest Pool (northeastern portion).

PHOTOGRAPHIC LOG

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Headquarters Impoundment Design/Build
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E-39





Photo 37

General view of the Southwest Pool (western portion).



Photo 38

General view of the Southwest Pool (central portion).

PHOTOGRAPHIC LOG

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Headquarters Impoundment Design/Build
Project
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E-40





Photo 39

General view of the Southwest Pool (southeast portion by South Observation Tower).



Photo 40

General view of the northern end of the Cross Dike.

PHOTOGRAPHIC LOG

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Headquarters Impoundment Design/Build
Project
Galloway Twp, Atlantic Co, New Jersey

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E-41





Photo 41

Eastern end of the Long Dike, facing northwest.



Photo 42

General view of breach in the Long Dike.

PHOTOGRAPHIC LOG

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Headquarters Impoundment Design/Build
Project
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E-42





Photo 43

Experimental Pool.



Photo 44

**Doughty Creek at Lily
Lake Bridge, facing east.**

PHOTOGRAPHIC LOG

Edwin B. Forsythe National Wildlife Refuge
Headquarters Impoundment Design/Build
Project
Galloway Twp, Atlantic Co, New Jersey

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Somerset, NJ 08873
E-43





Photo 45

**Lily Lake, viewed from
Lily Lake Bridge, facing
west.**



Photo 46

**Western end of the Long
Dike, viewed from the Gull
Pond Tower area, facing
east.**

PHOTOGRAPHIC LOG

Edwin B. Forsythe National Wildlife Refuge
Headquarters Impoundment Design/Build
Project
Galloway Twp, Atlantic Co, New Jersey

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Infrastructure, Inc.
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E-44





Photo 47

Northwest Pool, at the Gull Pond Tower area.



Photo 48

Long Dike, bisecting the West Pools, viewed from the Gull Pond Tower, facing east.

PHOTOGRAPHIC LOG

Edwin B. Forsythe National Wildlife Refuge
Headquarters Impoundment Design/Build
Project
Galloway Twp, Atlantic Co, New Jersey

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E-45



APPENDIX F

THREATENED AND ENDANGERED SPECIES FINDINGS

HQ Impoundments Design/Build Project

IPaC Trust Resource Report

Generated August 05, 2015 03:18 PM MDT



US Fish & Wildlife Service

IPaC Trust Resource Report



Project Description

NAME

HQ Impoundments Design/Build
Project

PROJECT CODE

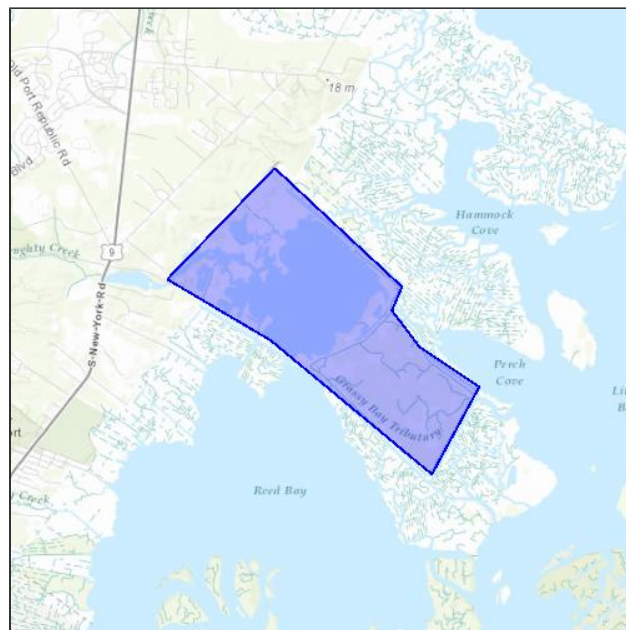
SBROC-GGL6B-HVTPT-VAUPJ-D7KY2E

LOCATION

Atlantic County, New Jersey

DESCRIPTION

No description provided



U.S. Fish & Wildlife Contact Information

Species in this report are managed by:

New Jersey Ecological Services Field Office

927 North Main Street, Building D

Pleasantville, NJ 08232-1454

(609) 646-9310

Endangered Species

Proposed, candidate, threatened, and endangered species that are managed by the [Endangered Species Program](#) and should be considered as part of an effect analysis for this project.

This unofficial species list is for informational purposes only and does not fulfill the requirements under [Section 7](#) of the Endangered Species Act, which states that Federal agencies are required to "request of the Secretary of Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action." This requirement applies to projects which are conducted, permitted or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can be obtained by returning to this project on the IPaC website and requesting an Official Species List from the regulatory documents section.

Birds

Red Knot *Calidris canutus rufa*

Threatened

CRITICAL HABITAT

No critical habitat has been designated for this species.

<https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DM>

Flowering Plants

American Chaffseed *Schwalbea americana*

Endangered

CRITICAL HABITAT

No critical habitat has been designated for this species.

<https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2I4>

Hirst Brothers' Panic Grass *Dichanthelium (=Panicum) hirstii*

Candidate

CRITICAL HABITAT

No critical habitat has been designated for this species.

<https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q1BG>

Knieskern's Beaked-rush *Rhynchospora knieskernii*

Threatened

CRITICAL HABITAT

No critical habitat has been designated for this species.

<https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q216>

Swamp Pink *Helonias bullata*

Threatened

CRITICAL HABITAT

No critical habitat has been designated for this species.

<https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2B8>

Mammals

Northern Long-eared Bat *Myotis septentrionalis*

Threatened

CRITICAL HABITAT

No critical habitat has been designated for this species.

<https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0JE>

Critical Habitats

Potential effects to critical habitat(s) within the project area must be analyzed along with the endangered species themselves.

There is no critical habitat within this project area

Migratory Birds

Birds are protected by the [Migratory Bird Treaty Act](#) and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service ([1](#)). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

You are responsible for complying with the appropriate regulations for the protection of birds as part of this project. This involves analyzing potential impacts and implementing appropriate conservation measures for all project activities.

American Oystercatcher <i>Haematopus palliatus</i> Year-round https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?sPCODE=B0G8	Bird of conservation concern
American Bittern <i>Botaurus lentiginosus</i> Season: Wintering https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?sPCODE=B0F3	Bird of conservation concern
Bald Eagle <i>Haliaeetus leucocephalus</i> Year-round https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?sPCODE=B008	Bird of conservation concern
Black Skimmer <i>Rynchops niger</i> Season: Breeding https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?sPCODE=B0EO	Bird of conservation concern
Black Rail <i>Laterallus jamaicensis</i> Season: Breeding https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?sPCODE=B09A	Bird of conservation concern
Black-billed Cuckoo <i>Coccyzus erythrophthalmus</i> Season: Breeding https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?sPCODE=B0HI	Bird of conservation concern
Blue-winged Warbler <i>Vermivora pinus</i> Season: Breeding	Bird of conservation concern
Fox Sparrow <i>Passerella iliaca</i> Season: Wintering	Bird of conservation concern
Gull-billed Tern <i>Gelochelidon nilotica</i> Season: Breeding	Bird of conservation concern
Horned Grebe <i>Podiceps auritus</i> Season: Wintering	Bird of conservation concern
Hudsonian Godwit <i>Limosa haemastica</i> Season: Migrating	Bird of conservation concern
Least Bittern <i>Ixobrychus exilis</i> Season: Breeding	Bird of conservation concern
Least Tern <i>Sterna antillarum</i> Season: Breeding	Bird of conservation concern

Lesser Yellowlegs <i>Tringa flavipes</i> Season: Wintering	Bird of conservation concern
Peregrine Falcon <i>Falco peregrinus</i> Season: Wintering https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FU	Bird of conservation concern
Pied-billed Grebe <i>Podilymbus podiceps</i> Year-round	Bird of conservation concern
Prairie Warbler <i>Dendroica discolor</i> Season: Breeding	Bird of conservation concern
Prothonotary Warbler <i>Protonotaria citrea</i> Season: Breeding	Bird of conservation concern
Purple Sandpiper <i>Calidris maritima</i> Season: Wintering	Bird of conservation concern
Red Knot <i>Calidris canutus rufa</i> Season: Wintering https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DM	Bird of conservation concern
Rusty Blackbird <i>Euphagus carolinus</i> Season: Wintering	Bird of conservation concern
Saltmarsh Sparrow <i>Ammodramus caudacutus</i> Year-round	Bird of conservation concern
Seaside Sparrow <i>Ammodramus maritimus</i> Year-round	Bird of conservation concern
Short-eared Owl <i>Asio flammeus</i> Season: Wintering https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HD	Bird of conservation concern
Snowy Egret <i>Egretta thula</i> Season: Breeding	Bird of conservation concern
Upland Sandpiper <i>Bartramia longicauda</i> Season: Breeding https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HC	Bird of conservation concern
Wood Thrush <i>Hylocichla mustelina</i> Season: Breeding	Bird of conservation concern
Worm Eating Warbler <i>Helmitheros vermivorum</i> Season: Breeding	Bird of conservation concern

Refuges

Any activity proposed on [National Wildlife Refuge](#) lands must undergo a 'Compatibility Determination' conducted by the Refuge. If your project overlaps or otherwise impacts a Refuge, please contact that Refuge to discuss the authorization process.

Edwin B. Forsythe National Wildlife Refuge

40,141.64 acres

PHONE (609) 652-1665

ADDRESS

800 Great Creek Road
Oceanville, NJ 08231

<http://www.fws.gov/refuges/profiles/index.cfm?id=52510>

Wetlands

Impacts to [NWI wetlands](#) and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

Project proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate [U.S. Army Corps of Engineers District](#).

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Wetland data is unavailable at this time.

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

Project Name:	Headquarters Impoundment Resiliency Projects (37b)	Originating Person:	Marc Virgilio
Townships:	Galloway Township	Telephone Number:	609-748-1535
County:	Atlantic County	Email Address:	Marc_Virgilio@fws.gov
Date:	11/30/2015		

Distance to nearest town: Adjacent

I. Region: 5

II. Service Activity (Program): NWRS, Edwin B. Forsythe NWR

III. Pertinent Species and Habitat:

A. Listed species and/or their critical habitat within the action area:

Birds

Red Knot (*Calidris canutus rufa*)

Plants

American Chaffseed (*Schwalbea Americana*)

Knieskern's Beaked-rush (*Rhynchospora knieskernii*)

Swamp Pink (*Helonias bullata*)

Mammals

Northern Long-eared Bat (*Myotis septentrionalis*)

B. Proposed species and/or proposed critical habitat within the action area:

None

C. Candidate species within the action area:

Plants

Hirst Brothers' Panic Grass (*Dichanthelium (Panicum) hirstii*)

D. Include species/habitat occurrences on a map.

See attached Information for Planning and Conservation (IPaC) trust resources list.

IV. Description of proposed action (attach additional pages as needed):

The Proposed Action is to conduct infrastructure repairs to the Headquarters Impoundment System (System) to restore reduced management ability and ensure resiliency of the System in the face of future storm events. The System was constructed in the early 1950s to meet the habitat needs of migratory birds (e.g., waterfowl, shorebirds, and wading birds). The approximately 1500 acre system consists primarily of Lily Lake, Doughty Creek, Northwest Pool, Southwest Pool, and East Pool. The exterior impoundment dike, known as Wildlife Drive, is open to the public and receives over 100,000 visitors annually. Hurricane Sandy significantly

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

impacted the dike system and required emergency repairs to maintain its integrity. The Refuge plans to conduct a number of projects along the impoundments to ensure the continued resiliency of the System. Construction tasks of the Proposed Action are scheduled to occur March-May 2016 and will consist of:

- Stabilization/armoring of approximately 1500ft of the Turtle Cove section of South Dike.
- Stabilization/armoring of approximately 600ft of the Dog Leg section of North Dike.
- Repair of approximately 2,000ft of breached or eroded portions of Long Dike.
- Repair or replacement of Water Control Structure #3.
- Resurface six miles of Wildlife Drive.

V. Determination of effects:

A. Explanation of effects of the action on species and critical habitats in items III. A, B, and C (attach additional pages as needed):

The majority of construction activities for this project will be conducted on impoundment roadways or previously disturbed areas. There are no critical habitats documented within the Project area.

Red Knot migrate through coastal areas in the spring and fall and spend winters along coastal waters in Central and South America. In the spring, they are generally concentrated on Delaware Bay beaches, feeding on horseshoe crab (*Limulus polyphemus*) eggs. The refuge has conducted weekly bird surveys of the HQ Impoundment System since 2008. Over the past seven years, Red Knot have been observed a total of seven times, and in numbers no greater than 12. Impacts on Red Knot are anticipated to be minimal as this work will primarily occur in Spring (March- May) when Red Knot will be concentrated on Delaware Bay beaches. There may be some avoidance of the construction area by bird species as a result of increased noise and human activity; however, these impacts are not considered significant and will be temporary in nature.

American chaffseed is an obligate freshwater wetland species and although other parts of the refuge may support this species, is not known to exist within the project area.

Knieskern's Beaked-rush is an obligate freshwater wetland species and although other parts of the refuge may support this species, is not known to exist within the project area.

Swamp Pink is an obligate freshwater wetland species and is not known to occur in the project area.

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

Hirst Brother's Panic Grass is an obligate freshwater wetland species and although other parts of the refuge may support this species, is not known to exist within the project area.

Northern Long-eared Bats may exist in the forested parts of the refuge adjacent to project areas, but these areas will not be impacted by the proposed work.

B. Explanation of actions to be implemented to reduce adverse effects:

American chaffseed, Knieskern's beaked-rush, Swamp pink, and Hirst brother's panic grass are not known to exist on this work site. However, field personnel will be educated in plant identification and instructed to avoid walking through sensitive wetland areas outside of the work areas to reduce any potential effects on sensitive plants.

Field crews will be educated on Red Knot identification and will be instructed to avoid disturbing any birds if they are observed in the work areas. Field crews will report any Red Knot sightings to refuge management.

No work will occur at night or in forested areas, so this work will not impact Northern Long-eared Bats.

VI. Effect determination and response requested: [* = optional]

A. Listed species/designated critical habitat:

Determination

Response requested

No effect/no adverse modification
(Species: Red Knot, American Chaffseed,
Knieskern's beaked-rush, Swamp Pink,
Northern Long-eared bat)

X Concurrence

May affect, but is not likely to adversely
affect species/adversely modify critical habitat
(Species: Red Knot)

✓ *Concurrence

May affect, and is likely to adversely
affect species/adversely modify critical habitat
(Species: Northern Long-eared bat)

____ Formal Consultation

B. Proposed species/proposed critical habitat:

Determination

Response requested

No effect on proposed species/no adverse

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

modification of proposed critical habitat
(Species: _____)

_____ *Concurrence

Is likely to jeopardize proposed species/
adversely modify proposed critical habitat
(Species: _____)

_____ Conference

C. Candidate species:

Determination

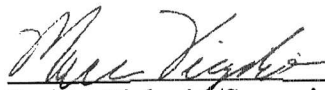
Response requested

No effect
(species: Hirst Brothers' Panic Grass)

X *Concurrence

Is likely to jeopardize candidate species
(species: _____)

_____ Conference



Project Biologist/Supervisor (Requestor)

11/30/15
Date

VII. Reviewing ESFO Evaluation:

A. Concurrence ✓

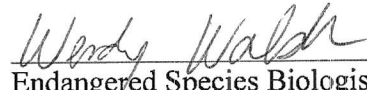
Nonconcurrence _____

B. Formal consultation required _____

C. Conference required _____

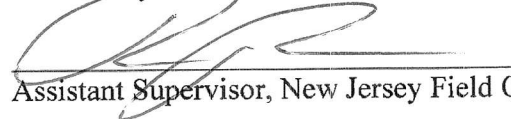
D. Informal conference required _____

E. Remarks (attach additional pages as needed):



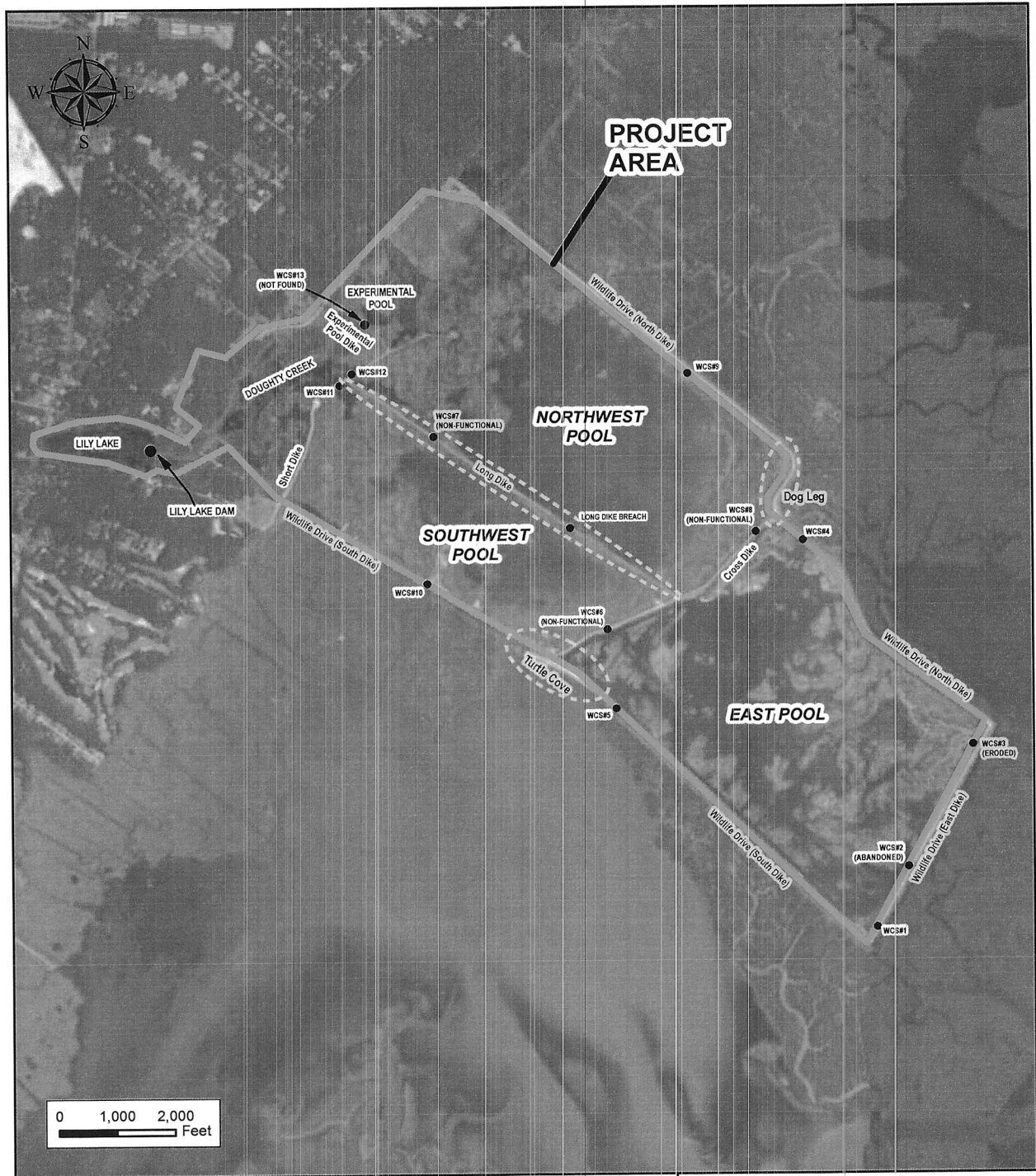
Endangered Species Biologist (Reviewer),
New Jersey Field Office

1-26-16
Date



Assistant Supervisor, New Jersey Field Office

26 Jan 16
Date



- LEGEND**
- PROJECT AREA
 - WATER CONTROL STRUCTURE
 - WORK AREA
 - WCS# (ERODED) WORK AREA

Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

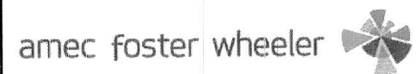


Figure 1.3
Project Site Map
HQ Impoundment Design-Build Project
E.B. Forsythe National Wildlife Refuge
Oceanville, New Jersey

Rev. By: CB	Project No.: 3617157354	November 2015
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State of New Jersey

CHRIS CHRISTIE
Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
State Forestry Services
Mail Code 501-04
ONLM -Natural Heritage Program
P.O. Box 420
Trenton, NJ 08625-0420
Tel. #609-984-1339
Fax. #609-984-1427

BOB MARTIN
Commissioner

KIM GUADAGNO
Lt. Governor

August 11, 2015

Christy L. Benes
AMEC Foster Wheeler Environment & Infrastructure, Inc.
285 Davidson Avenue, Suite 405
Somerset, NJ 08873

Re: EBF National Wildlife Refuge - Headquarters Impoundment Design/Build Project
Block(s) - 1301, Lot(s) - 1
Galloway Township, Atlantic County

Dear Ms. Benes:

Thank you for your data request regarding rare species information for the above referenced project site in Galloway Township, Atlantic County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.1) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Landscape Project habitat mapping and the Biotics Database for occurrences of any rare wildlife species or wildlife habitat on the referenced site. The Natural Heritage Database was searched for occurrences of rare plant species or ecological communities that may be on the project site. Please refer to Table 1 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented on site. A detailed report is provided for each category coded as 'Yes' in Table 1.

We have also checked the Landscape Project habitat mapping and Biotics Database for occurrences of rare wildlife species or wildlife habitat in the immediate vicinity (within ¼ mile) of the referenced site. Additionally, the Natural Heritage Database was checked for occurrences of rare plant species or ecological communities within ¼ mile of the site. Please refer to Table 2 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented within the immediate vicinity of the site. Detailed reports are provided for all categories coded as 'Yes' in Table 2. These reports may include species that have also been documented on the project site.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. Please refer to Tables 1 and 2 (attached) to determine if any priority sites are located on or in the vicinity of the site.

A list of rare plant species and ecological communities that have been documented from the project site, referenced above, can be downloaded from <http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html>. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2010.pdf.

NHP File No. 15-3907444-8128

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive NJ-GeoWeb website at the following URL, <http://www.state.nj.us/dep/gis/geoweb splash.htm> or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292-9400.

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from <http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf>.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,



Robert J. Cartica
Administrator

c: NHP File No. 15-3907444-8128

NHP File No. 15-3907444-8128

Table 1: On Site Data Request Search Results (7 Possible Reports)

<u>Report Name</u>	<u>Included</u>	<u>Number of Pages</u>
1. Possibly on Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	No	0 pages included
2. On or In the Immediate Vicinity of the Project Site Based on Search of the Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	No	0 pages included
3. Natural Heritage Priority Sites On Site	No	0 pages included
4. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches	Yes	3 page(s) included
5. Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.1	No	0 pages included
6. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File	No	0 pages included
7. Other Animal Species On the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program	Yes	1 page(s) included

<p align="center">Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches</p>

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
<i>Aves</i>								
	Bald Eagle	Haliaeetus leucocephalus	Foraging	4	NA	State Endangered	G5	S1B,S2N
	Bald Eagle	Haliaeetus leucocephalus	Wintering	3	NA	State Threatened	G5	S1B,S2N
	Black Rail	Laterallus jamaicensis	Breeding Sighting-Confirmed	4	NA	State Endangered	G4	S1B,S2N
	Black Skimmer	Rynchops niger	Foraging	4	NA	State Endangered	G5	S1B,S1N
	Black-crowned Night-heron	Nycticorax nycticorax	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Caspian Tern	Hydroprogne caspia	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Cattle Egret	Bubulcus ibis	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Common Tern	Sterna hirundo	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Cooper's Hawk	Accipiter cooperii	Breeding Sighting	2	NA	Special Concern	G5	S3B,S4N
	Cooper's Hawk	Accipiter cooperii	Nest	2	NA	Special Concern	G5	S3B,S4N
	Glossy Ibis	Plegadis falcinellus	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Great Blue Heron	Ardea herodias	Foraging	2	NA	Special Concern	G5	S3B,S4N

<p align="center">Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches</p>

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
	Gull-billed Tern	Gelochelidon nilotica	Foraging	2	NA	Special Concern	G5	S3B,S3N
	Least Tern	Sternula antillarum	Foraging	4	NA	State Endangered	G4	S1B,S1N
	Little Blue Heron	Egretta caerulea	Foraging	2	NA	Special Concern	G5	S3B,S3N
	Long-eared Owl	Asio otus	Non-breeding Sighting	3	NA	State Threatened	G5	S2B,S2N
	Osprey	Pandion haliaetus	Foraging	3	NA	State Threatened	G5	S2B
	Osprey	Pandion haliaetus	Nest	3	NA	State Threatened	G5	S2B
	Peregrine Falcon	Falco peregrinus	Nest	4	NA	State Endangered	G4	S1B,S3N
	Pied-billed Grebe	Podilymbus podiceps	Breeding Sighting-Confirmed	4	NA	State Endangered	G5	S1B,S3N
	Red Knot	Calidris canutus	Non-breeding Sighting	4	NA	State Endangered	G4	S1N
	Red-shouldered Hawk	Buteo lineatus	Non-breeding Sighting	2	NA	Special Concern	G5	S1B,S3N
	Sanderling	Calidris alba	Non-breeding Sighting	2	NA	Special Concern	G5	S3N
	Snowy Egret	Egretta thula	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Tricolored Heron	Egretta tricolor	Foraging	2	NA	Special Concern	G5	S3B,S3N

<p align="center">Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches</p>

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
	Whimbrel	Numenius phaeopus	Non-breeding Sighting	2	NA	Special Concern	G5	S3N
	Yellow-crowned Night-heron	Nyctanassa violacea	Foraging	3	NA	State Threatened	G5	S2B,S2N

**Other Animal Species
On the Project Site Based on
Additional Species Tracked by
Endangered and Nongame Species Program**

Scientific Name	Common Name	Federal Protection Status	State Protection Status	Grank	Srank
<i>Vertebrate Animals</i>					
Malaclemys terrapin terrapin	Northern Diamondback Terrapin			G4T4Q	S3
Total number of records:	1				

Table 2: Vicinity Data Request Search Results (6 possible reports)

<u>Report Name</u>	<u>Included</u>	<u>Number of Pages</u>
1. Immediate Vicinity of the Project Site Based on Search of Natural Heritage Database Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	No	0 pages included
2. Natural Heritage Priority Sites within the Vicinity	No	0 pages included
3. Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches	Yes	3 page(s) included
4. Vernal Pool Habitat In the Immediate Vicinity of Project Site Based on Search of Landscape Project 3.1	No	0 pages included
5. Rare Wildlife Species or Wildlife Habitat In the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Stream Habitat File	No	0 pages included
6. Other Animal Species In the Immediate Vicinity of the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program	No	0 pages included

**Rare Wildlife Species or Wildlife Habitat Within the
Immediate Vicinity of the Project Site Based on Search of
Landscape Project 3.1 Species Based Patches**

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
<i>Aves</i>								
	Bald Eagle	Haliaeetus leucocephalus	Foraging	4	NA	State Endangered	G5	S1B,S2N
	Bald Eagle	Haliaeetus leucocephalus	Wintering	3	NA	State Threatened	G5	S1B,S2N
	Black Rail	Laterallus jamaicensis	Breeding Sighting-Confirmed	4	NA	State Endangered	G4	S1B,S2N
	Black Skimmer	Rynchops niger	Foraging	4	NA	State Endangered	G5	S1B,S1N
	Black-crowned Night-heron	Nycticorax nycticorax	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Black-crowned Night-heron	Nycticorax nycticorax	Nesting Colony	3	NA	State Threatened	G5	S2B,S3N
	Caspian Tern	Hydroprogne caspia	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Cattle Egret	Bubulcus ibis	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Common Tern	Sterna hirundo	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Cooper's Hawk	Accipiter cooperii	Breeding Sighting	2	NA	Special Concern	G5	S3B,S4N
	Cooper's Hawk	Accipiter cooperii	Nest	2	NA	Special Concern	G5	S3B,S4N
	Glossy Ibis	Plegadis falcinellus	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Great Blue Heron	Ardea herodias	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Gull-billed Tern	Gelochelidon nilotica	Foraging	2	NA	Special Concern	G5	S3B,S3N

**Rare Wildlife Species or Wildlife Habitat Within the
Immediate Vicinity of the Project Site Based on Search of
Landscape Project 3.1 Species Based Patches**

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
	Least Tern	<i>Sternula antillarum</i>	Foraging	4	NA	State Endangered	G4	S1B,S1N
	Little Blue Heron	<i>Egretta caerulea</i>	Foraging	2	NA	Special Concern	G5	S3B,S3N
	Long-eared Owl	<i>Asio otus</i>	Non-breeding Sighting	3	NA	State Threatened	G5	S2B,S2N
	Osprey	<i>Pandion haliaetus</i>	Foraging	3	NA	State Threatened	G5	S2B
	Osprey	<i>Pandion haliaetus</i>	Nest	3	NA	State Threatened	G5	S2B
	Peregrine Falcon	<i>Falco peregrinus</i>	Nest	4	NA	State Endangered	G4	S1B,S3N
	Pied-billed Grebe	<i>Podilymbus podiceps</i>	Breeding Sighting- Confirmed	4	NA	State Endangered	G5	S1B,S3N
	Red Knot	<i>Calidris canutus</i>	Non-breeding Sighting	4	NA	State Endangered	G4	S1N
	Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	Non-breeding Sighting	3	NA	State Threatened	G5	S2B,S2N
	Red-shouldered Hawk	<i>Buteo lineatus</i>	Non-breeding Sighting	2	NA	Special Concern	G5	S1B,S3N
	Sanderling	<i>Calidris alba</i>	Non-breeding Sighting	2	NA	Special Concern	G5	S3N
	Sedge Wren	<i>Cistothorus platensis</i>	Non-breeding Sighting	4	NA	State Endangered	G5	S1B,S1N
	Snowy Egret	<i>Egretta thula</i>	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Tricolored Heron	<i>Egretta tricolor</i>	Foraging	2	NA	Special Concern	G5	S3B,S3N

**Rare Wildlife Species or Wildlife Habitat Within the
Immediate Vicinity of the Project Site Based on Search of
Landscape Project 3.1 Species Based Patches**

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
	Whimbrel	Numenius phaeopus	Non-breeding Sighting	2	NA	Special Concern	G5	S3N
	Yellow-crowned Night-heron	Nyctanassa violacea	Foraging	3	NA	State Threatened	G5	S2B,S2N

APPENDIX G
SHPO FINDINGS

SHPO Opinion Checklist

Property Name: Oceanville/Lock Port/Moss Mill Historic District
Location/Address: _____
County/Municipality: Galloway Twp/Atlantic County
SHPO Opinion date: 8/5/92 Chrono # H92-7 Log File # _____

Information in this file includes:
(checkmark or fill in data where applicable)

☒ SHPO Opinion letter
N/A Accessioned report title page and report #
0111-D2 Property information from accessioned report
or historic sites inventory (indicate HSI#)
N/A Photograph(s)
☒ Map(s) (USGS map with property located,
labelled & showing quad name; tax map;
site plan)

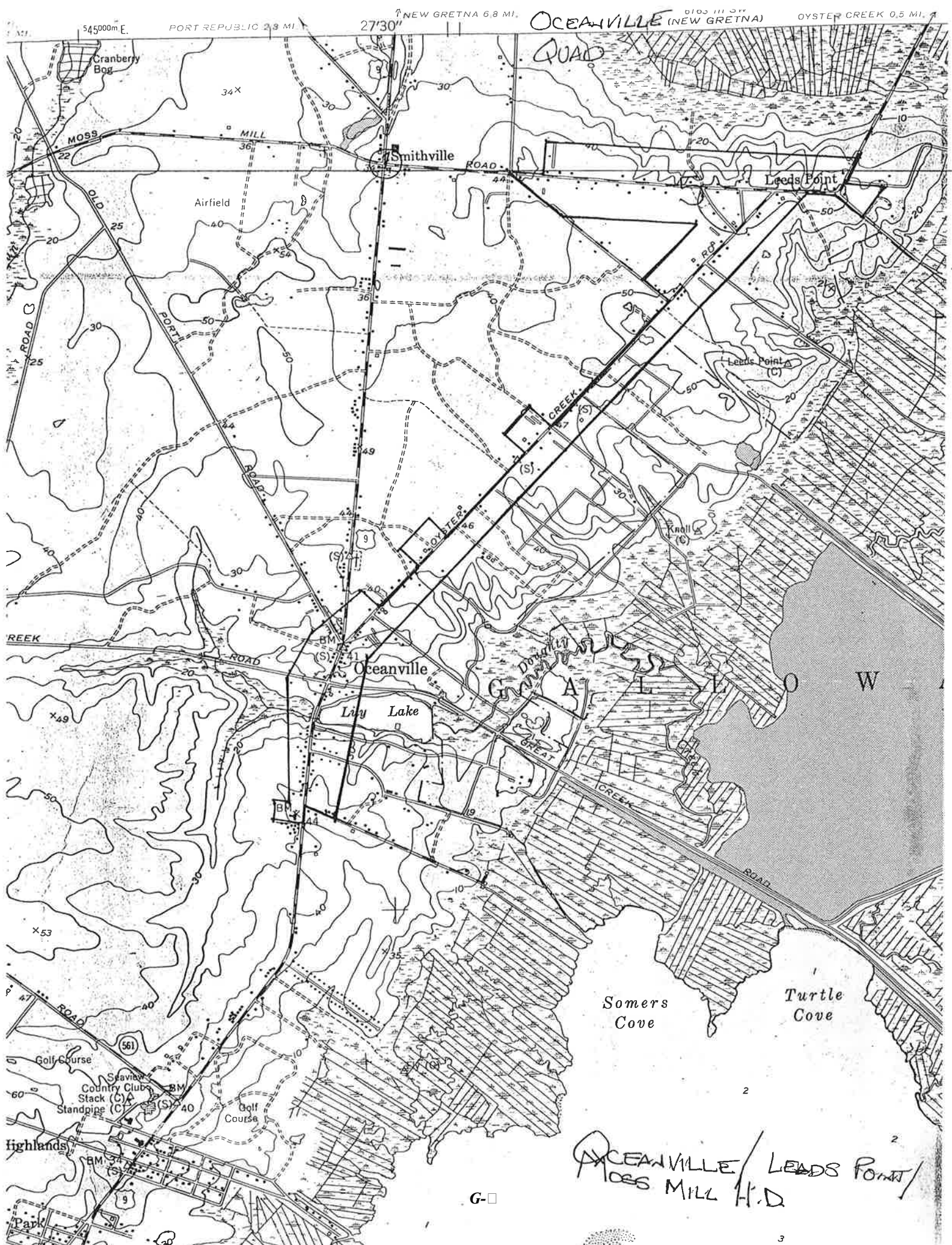
Additional information available in report or HSI: ____ yes ☒ no

Other Materials (check if applicable):

_____ HABS/HAER documentation
_____ Preservation Plan
_____ Conditions Assessment
_____ Historic Structure Report
_____ Alternative Analysis Report
_____ Project file
ProjectName: _____
_____ Other

Prepared by: ET

Date: 10/7



G-□

OCEANVILLE / LEADS POINT /
LOSS MILL H.D.

NEW JERSEY OFFICE OF CULTURAL AND ENVIRONMENTAL SERVICES
HISTORIC PRESERVATION SECTION
HISTORIC DISTRICT SURVEY FORM

HISTORIC SITES INVENTORY NO. 0111-D2

DISTRICT NAME:	Oceanville, Leeds Pt, Moss Mill Rd	UTM REFERENCES:	Zone/Northing/Easting
MUNICIPALITY:	Galloway		A
COUNTY:	Atlantic		B
TYPE OF DISTRICT:	Village/Rural/Residential		C
USGS QUAD:	Oceanville		D

DESCRIPTION: (General description of district as a whole and boundaries)

The Oceanville - Leeds Point Road - Moss Mill Road Historic District is a combination village and rural district extending along Leeds Point Road and Moss Mill Road. It includes the village of Oceanville and the residences in the rural area along Leeds Point and Moss Mill Roads. The district contains about one hundred buildings, of which about twenty are non-contributing to the significance of the district. This count does not include outbuildings which would be included in an actual National Register Nomination. The boundaries, as shown on the map, are irregular and run along curb lines and rear property lines, or a line about fifty to one hundred feet behind buildings. The properties included in the district border Route 9 starting at a point near its intersection with Somers Town Lane to its intersection with Leeds Point Road, then along that road to its intersection with Moss Mill Road, then along that road between Hammock Road and Schooner Landing. The area is bounded by the Brigantine National Wildlife Refuge to the east and north, and by expanding new residential development to the west.

The village area includes a very small number of commercial and institutional buildings, but the majority of the buildings in the district are residential. The non-contributing buildings are in this category primarily because they are quite new; they are generally on large lots and are compatible with the older buildings. The boundaries exclude incompatible areas to the west of the district, but would need re-checking before making an actual National Register nomination. It would also be necessary to determine whether some property owners might be interested in having their entire lots included in a district.

A variety of styles exist in the district, but there are probably more vernacular Gothic houses than anything else. There are a number of plain, rectangular houses dating from the early nineteenth to the early twentieth century as well as a few bungalows and houses of the cottage type. The Mathis House, near the end of Leeds Point Road is a large fieldstone early nineteenth century house that the Historic American Buildings Survey has already recorded and it is (to continuation sheet)

APPROXIMATE NUMBER OF BUILDINGS: 100

PHYSICAL CONDITION OF STRUCTURES: Excellent 45% Good 25% Fair 20% Poor ____%

REGISTER ELIGIBILITY: ☒ Yes ☐ Possible ☐ No

THREATS TO DISTRICT/LOCAL ATTITUDES:

New housing and commercial developments like that occurring to the west of Leeds Point Road are a potential threat to the district. This can make the large lots in the district much more valuable for development leading to demolition of existing buildings in favor of greater numbers of new, small buildings on each lot. A member of the Galloway Planning Commission who lives here and has expressed interest in the creation of an historic district.

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF CULTURAL AND ENVIRONMENTAL SERVICES
HISTORIC PRESERVATION SECTION, 109 WEST STATE STREET, TRENTON, NEW JERSEY 08625 (609) 292 - 2023

SIGNIFICANCE:

The Oceanville - Leeds Point Road - Moss Mill Road Historic District is significant under criterion A for its association with the history of Atlantic County. Leeds Point was one of the earliest and most important communities in the county. Daniel Leeds, a Quaker from Leeds, England moved here with his family in about 1700 and named the settlement Leeds Point. Leeds organized a Meeting of the Society of Friends here as early as 1700, and its first meeting house was built 1744 near the present Emmaus Methodist Church. Some historians consider Daniel Leeds' American Almanac published in 1686 to be the first almanac in America. Early stagecoach routes passed through Leeds Point continuing via Port Republic and Clarks Mills to Camden. Only houses remain today in Leeds Point, but a century ago there were a post office, a store, and a tavern as well as houses. One of New Jersey's most persistent legends originated in Leeds Point: the Jersey Devil. The bearing of a diabolical child is usually attributed to a Mrs. Leeds.

Oceanville is a small old settlement along Route 9 south of Smithville and is one of the few villages in this area that is not named for the first family that settled in it. The present church building dates from 1909, after a railroad line had started to run through the village. In 1892 the Brigantine Transit Company laid tracks to connect Brigantine Island with the mainland, and for a few years a spur line ran from Pomona through Oceanville directly to Brigantine. The tracks followed what is today Great Creek Road and went through the Marsh, around Reed's Bay to Brigantine Island. A storm destroyed the trestles after a few years, but the train continued to operate between Oceanville and Pomona, making it possible to ship clams and other produce from Oceanville to Philadelphia via the rail connection at Pomona.

The architecture within the district also makes it
(to Continuation Sheet)

REFERENCES: (Include representation in existing surveys)

Beers Map, Atlantic County, 1872; Russell M. Andrew, Railroading in Atlantic County, New Jersey, Atlantic County Historical Society, 1981; Eugene V. Young and Elaine Abrahamson, Story of Galloway, (Egg Harbor City, 1976); Alfred M. Heston. South Jersey, A History (New York, 1924)

ATTACHMENTS: (Indicate number)

40

MAPS: _____

PHOTOS: _____

SLIDES: _____

OTHER: (Specify)

RECORDED BY: Priscilla M. Thompson
The History Store

ORGANIZATION:

DATE: August, 1986

G-4

Continuation Sheet

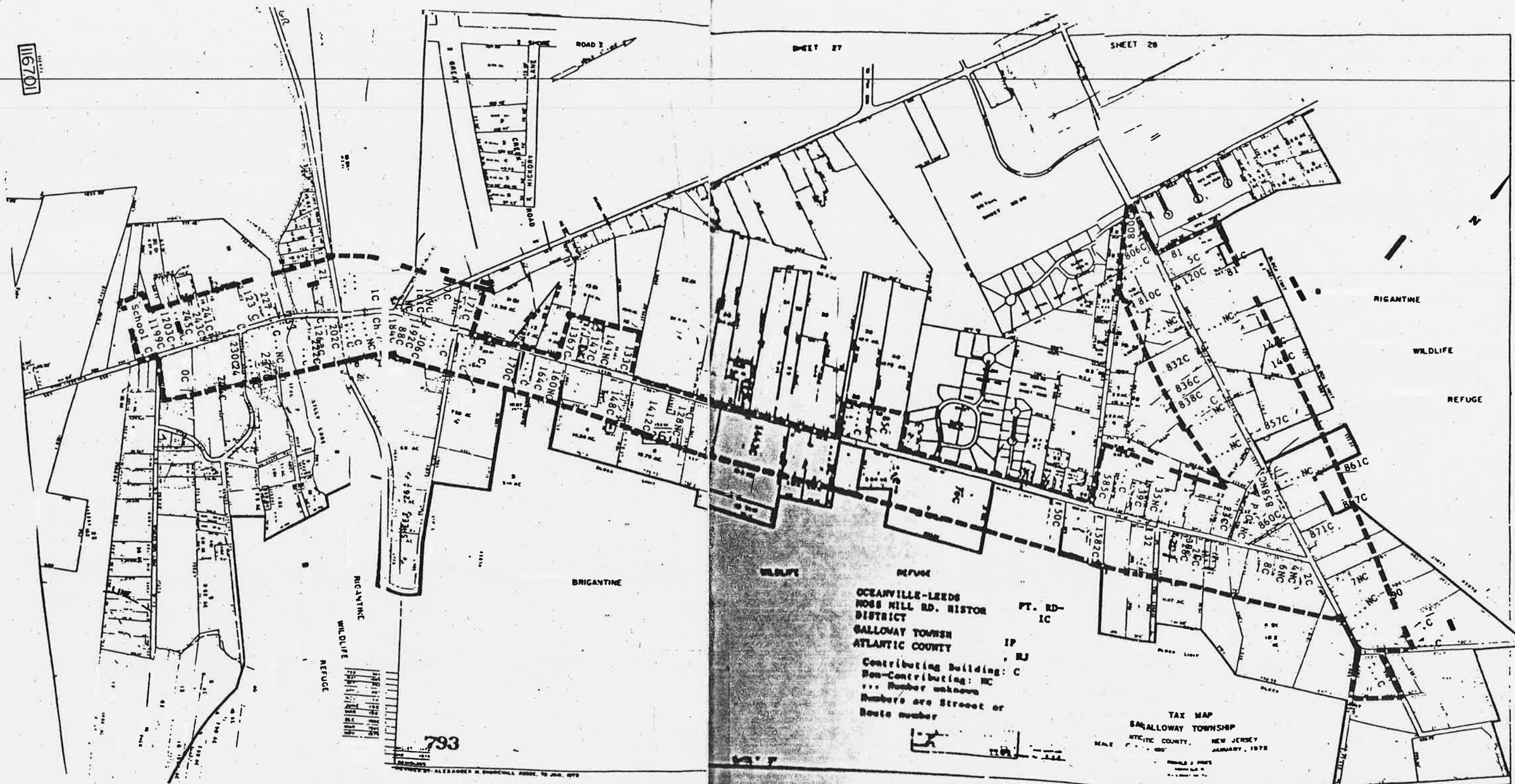
Oceanville - Leeds Point Road - Moss Mill Road Historic District
Galloway 0111-D2

Description Continued:

undoubtedly eligible for individual listing in the National Register. Most of the buildings are of wood; notable exceptions to this are the Mathis House and the Oceanville School. The majority of the buildings are of a similar scale - two stories high and set in large lots. Some of the lots along Leeds Point Road and Moss Mill Road are or were farms. The land is quite flat and vegetation is heavy. The appearance of the district has probably not changed a great deal since the late nineteenth century. It is one of the few areas in North Atlantic County where there is a relatively long stretch of road with almost no modern intrusions. A description of some individual buildings follows.

Significance Continued:

significant under Criterion C. The most important house individually is probably the fieldstone Mathis House. This very early nineteenth century house is a rare example of its type in Atlantic County and perhaps in New Jersey. The houses in the village of Oceanville date from the mid nineteenth century to the early twentieth century and include vernacular Gothic houses, Bungalows, and rectangular houses with gable roofs. Similar styles appear along Leeds Point Road and Moss Mill Road showing how housing developed through this village/rural area for over a century and a half.



RECEIVED

MAY 11 2004

HISTORIC PRESERVATION OFFICE

Draft

**PHASE IA CULTURAL RESOURCES
RECONNAISSANCE
NEW JERSEY INTRACOASTAL WATERWAY
CAPE MAY, ATLANTIC, AND
OCEAN COUNTIES, NEW JERSEY**

Dolan Research, Inc.



**PHASE IA CULTURAL RESOURCES RECONNAISSANCE
NEW JERSEY INTRACOASTAL WATERWAY
CAPE MAY, ATLANTIC. AND
OCEAN COUNTIES, NEW JERSEY**

SUBMITTED TO:

Aguilar Environmental, Inc.
75 Paterson Street
Suite 9
New Brunswick, NJ 08901

SUBMITTED BY:

J. Lee Cox, Jr.

Dolan Research, Inc.
30 Paper Mill Road
Newtown Square, PA 19073

February 2003

MANAGEMENT SUMMARY

Dolan Research, Inc. (DR) has completed a Phase IA Cultural Resources Reconnaissance of selected portions of the New Jersey Intracoastal Waterway (NJIWW), Cape May, Atlantic and Ocean Counties, New Jersey. Within a 70-mile portion of the NJIWW, 26 specific sites were selected by the COE for various improvements projects that include; channel relocation, marsh restoration, upland restoration, beach nourishment, aquatic restoration, habitat enhancement, expansion of disposal areas and establishing set-up/staging areas. No properties listed on the State or National Registers of Historic Places are present within or immediately adjacent to any of the 26 areas where improvements are planned. No previously recorded prehistoric archaeological sites are known to exist in or near the proposed project work sites. Analysis of historic cartography indicates the presence of one historic property within the NJIWW.

The only historic structure(s) is the fish factory complex that comprised Site 53 of Seven Islands, Ocean County. A previous sites inventory concluded that the facility was considered possibly eligible for the National Register as the "Crab Island Historic District." Additional documentation of the site is recommended before any potential impact is conducted at this site. A goal of the investigation would be to determine whether the site possesses the minimum criteria for listing on the National Register of Historic Places.

In the opinion of DR, the low marsh and high marsh topography of the NJIWW makes it unlikely that any cultural material would be located within any of the project sites. They are considered to possess a low probability for containing potentially significant cultural resources. The one exception is Site 103A/B, which is not located within the NJIWW. Site 103A/B is situated on the Stone Harbor beach at Hereford Inlet and is considered by DR to possess a high potential to contain shipwreck material from vessels that foundered in the Hereford Inlet vicinity. A previous cultural resource study has listed more than 22 documented shipwreck losses in Hereford Inlet. Nevertheless, in the context of the current project, no further archaeological analysis is recommended for this shoreline site, since beach nourishment (the proposed impact) should serve to protect buried resources, if indeed they exist here.

While not identified as project sites, dredging of the various channels in the NJIWW may impact potential submerged cultural resources. Background research indicates extensive historic maritime activities throughout many regions of the NJIWW. While the NJIWW was first dredged in 1908, a wide variety of vessels have undoubtedly sunk, wrecked, or been abandoned along the reaches of the NJIWW since it was first improved. In 2002, a dredge working at near Sedge Island, Atlantic County struck a shipwreck site adjacent to the channel of the NJIWW. Many wrecks are likely buried alongside the channels and may be impacted during any dredging activities whether it is maintenance dredging or the creation of a new channel. Potential submerged sites representative of all phases of New Jersey's maritime heritage may exist alongside the NJIWW. Phase I remote sensing surveys are recommended prior to any dredging activities in the NJIWW.

Site 59A/B

Sites 59A/B are located near the southern limits of the Edwin B. Forsythe National Wildlife Refuge, north of the Absecon Wildlife Management Area and next to Oceanville, Atlantic County. The two marsh sites (together slightly more than 200 acres in size) have undergone significant levels of mosquito control measure in the form of numerous drainage ditches. The sites are being considered as candidates for open-marsh practices; procedures that would fill many of the drainage ditches and create ponds for fish habitats.

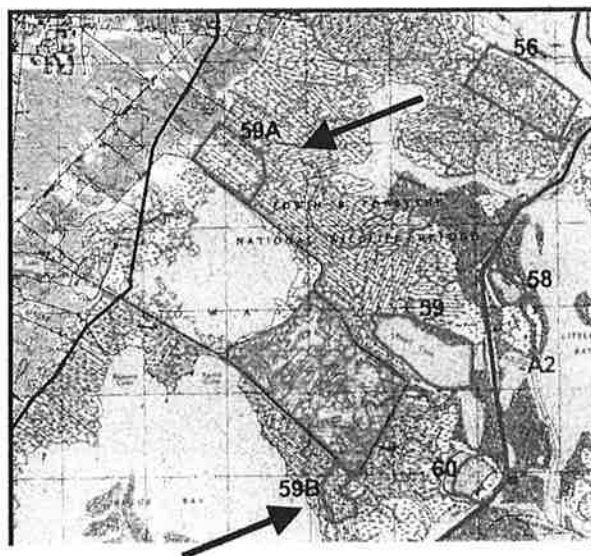


Plate 5: Aerial Photograph of Site 59B
(Source: IT Corp. 2001)

Figure 19: Location of Sites 59A/B

There are no known prehistoric sites located within study areas 59A or 59B. The closest recorded aboriginal site (28-At-8) is located about three-quarters of a mile to the north of study area 59A in the community of Leeds Point. This site was recorded in 1913 during Alanson Skinner and Max Schrabisch's archaeological survey of New Jersey. The site was recorded as consisting of "scattered shells indicating Indian occupation" (Skinner and Schrabisch 1913:52).

There are no known historic resources within either of the three study areas. No historic structures are shown on the map of Atlantic County in 1872 (Beers 1872a). The United States Geological Survey Map, Oceanville, New Jersey Quadrangle of 1952 also shows no buildings in the study areas, which in the case of Site 59A and B is depicted as marshland with a series of drainage ditches likely constructed for the cultivation of salt hay (United States Geological Survey 1952a). The northern boundary line for Site 59B runs along an informal road known as Great Creek Road. This road was likely constructed to facilitate access to the salt marshes and the cultivation of salt hay. Site 59 has been historically known as Perch Cove since at least 1872.

APPENDIX H
DRAFT FONSI

Edwin B. Forsythe National Wildlife Refuge

NEPA - Finding of No Significant Impact (FONSI)

Headquarters Impoundment Design/Build Project Galloway Township, Atlantic County, NJ

December 2015

DESCRIPTION OF PROPOSED ACTION

The Edwin B. Forsythe National Wildlife Refuge (Refuge) consists of more than 47,000 acres, and is owned and managed by the United States Fish and Wildlife Service (Service). The proposed project is the restoration of an area designated as the Headquarters (HQ) of the Refuge, located in the unincorporated community of Oceanville in Galloway Township, Atlantic County, New Jersey. It is identified as a portion of Block 1301, Lot 1 and is over 1,300 acres in size.

The Project area consists of a number of impoundments known as the HQ Impoundment System (the System). The System was constructed in the early 1950s to allow the Service to manage the habitat needs of migratory birds. The System includes the East Pool, West Pools, Experimental Pool, Gull Pond, Doughty Creek, and Lily Lake. Various dikes and water control structures (WCS's) are used to actively manage the inflow and outflow of water through the System. An approximately 8-mile perimeter dike surrounds the East and West Pools, which is used as a wildlife viewing drive (Wildlife Drive) and receives over 100,000 visitors annually. Currently, one of the dikes has been breached and some of the WCS's are inoperative.

The proposed action includes a number of singular restoration/construction/management activities required to effectively restore water flow, control, and containment function within the System. By re-establishing control within the System, the impoundments can be managed as separate freshwater and salt marsh wetland habitat communities, habitats that are vital to migrating bird populations that rely on such local communities for foraging, reproduction, and survival.

ALTERNATIVES CONSIDERED

The proposed action alternative (Alternative 1), optional supplemental activities to Alternative 1 (Alternatives 1a and 1b), and the no action alternative (Alternative 2) were considered and are discussed in Chapter 2 of the Environmental Assessment (EA), dated December 14, 2015. Additional potential actions that were considered as part of data gathering efforts, but were removed from consideration due to disqualifying factors such as cost-effectiveness and producing adverse impacts with limited benefit, are also discussed in Chapter 2 of the EA.

The preferred alternative, Alternative 1, was found to meet the project goals and objectives with a minimum amount of environmental disturbance, while providing the desired water flow and containment function necessary to establish three separate, fully-functional wetland habitat communities. This will give the Service the ability to better manage the impoundments as wintering grounds and migratory stopover sites or as breeding grounds for bird species reliant on such habitats. Alternatives 1a and 1b were found to potentially allow for greater management of the water within the System, and would allow for a higher degree of adaptive management by the Service in reaching their wildlife management objectives. The supplemental activities would be conducted in conjunction with the Proposed Action, should funding be made available by the Service, and additional environmental disturbance from these activities would be negligible.

The no action alternative, Alternative 2, was dismissed from further consideration because it would not produce the desired control of water flow in and out of the System, and would lead to the loss of critical wetland habitat used annually by thousands of migrating birds. Thus, the no action alternative would not fulfill the proposed action's purpose and need.

PUBLIC INVOLVEMENT

[To be written once Public Meetings are held.]

DETERMINATION OF FINDINGS

We have reviewed the anticipated beneficial and adverse impacts of the preferred alternative presented in Chapter 2 of the EA, and compared them to the alternatives. We reviewed the context and intensity of those predicted impacts over the short- and long-term, and considered the cumulative effects. The review of each of the NEPA factors was conducted to assess whether there will be significant environmental effect resulting from the proposed action in accordance with 40 C.F.R. 1508.27.

The proposed action would have long-term beneficial impacts to the freshwater and saltmarsh wetland habitats contained within the System by repairing the breached and deteriorating dikes and replacing one to two of the non-functional WCSs. The effect would be the reestablishment of Service's ability to conduct controlled drawdowns, a strategy used to provide foraging habitat for shorebirds by creating mudflats and shallow water areas, while at the same time concentrating food for wading birds.

Direct and indirect adverse impacts of the proposed action would be localized and short-term in nature, limited to the period of construction. These impacts will largely be limited to site construction activities that involve the repair of the dikes and replacement of WCSs. This involves

the temporary loss of existing vegetation and temporary displacement of wildlife due to construction noise and land disturbance.

1) Public Health and Safety

No aspect of the proposed action has been identified as having the potential to significantly and adversely impact public health or safety. During construction, some noise and exhaust from construction vehicles will create a temporary localized disturbance. However, the Service will make maximum use of public notification procedures, such as its website and Facebook page, to keep the public informed as to construction periods when access to the impoundment areas may be restricted.

2) Unique Characteristics of the Area

The project site is located within a component of the Edwin B. Forsythe National Wildlife Refuge, and includes both salt marsh and freshwater wetland habitat along the New Jersey coast. The proposed action would not have any adverse effects to the wetlands, but will instead provide an ecological enhancement to the surrounding environment.

3) Highly Controversial Effects

The proposed action will not have any significant adverse effects on the quality of the human environment and is, therefore, not likely to generate high levels of controversy. [To be confirmed: "Public response to the proposed action has been positive and supportive."]

4) Highly Uncertain Effects or Unknown Risks

The proposed action involves the replacement of WCSs that is not a unique decommissioning activity and does not represent the potential for unreasonable risk.

5) Precedent for Future Actions with Significant Effects

The proposed action represents an opportunity to implement the goals and advance the mission of the Service, and will not result in any significant effect on future actions.

6) Cumulatively Significant Impacts

The proposed action will not contribute to any cumulatively significant impacts. The proposed action would have no substantial adverse impacts on the adjacent land use, natural resources, or other planned future projects. Direct and indirect beneficial cumulative impacts are anticipated through the long-term benefits to fish and wildlife within and adjacent to the project site. Any direct and indirect adverse cumulative impacts attributed to the proposed action would be short-term and localized. As such, the proposed action will not have a significant cumulative impact.

7) Effects on Scientific, Cultural, or Historical Resources

The New Jersey State Historic Preservation Office and the NJ State Museum was consulted in order to fulfill the requirements under Section 106 of the National Historic Preservation Act. The proposed action will not have any adverse impacts to archaeological, cultural, or historical resources.

8) Effects on Endangered Species Act (ESA)-Listed Species and Habitats

The proposed action will not adversely affect any federal or state listed species or their habitat.

9) Threat of Violating any Environmental Law

There has been communications with state and federal regulatory agencies regarding the proposed action, and appropriate regulatory approvals (permits) are necessary prior to implementation. Therefore, there is no threat of violating any environmental law.

CONCLUSIONS

Based on the review of the information presented in this document and the analyses contained in the supporting Environmental Assessment, we find that the implementation of the Preferred Alternative (Alternative 1), with or without the supplemental activities (Alternatives 1a and 1b) for the Design/Build Project at the HQ Impoundment Project Area will not have a significant impact on the quality of the human environment, in accordance with Section 102(2)(c) of NEPA. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant adverse impacts. Accordingly, the preparation of an Environmental Impact Statement for this action is not required, and this FONSI is appropriate and warranted.

Regional Director
U.S. Fish and Wildlife Service

Date